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Oil spill contingency management, its financial arrangement and implications in the South Asian region

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OIL SPILL CONTINGENCY MANAGEMENT, ITS FINANCIAL ARRANGEMENT AND IMPLICATIONS IN THE SOUTH ASIAN REGION

BY

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DECLARATION

I certify that all the materials in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University

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ABSTRACT

Title of Dissertation: Oil Spill Contingency Management, its Financial Arrangement and Implications in South Asian Region

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Increasing marine transportation of oil inevitably results in accidental oil spills. The safety and preventive measures introduced internationally and nationally were able to reduce the number of spills and amount of accidental releases to the sea in the past decades. However, recent incidents show that marine oil spills are unpredictable events that may cause significant damage to the environment, wildlife and coastal communities.

This dissertation is a study of the status of oil spill contingency management in the South Asian region. A comprehensive analysis of factors, which contribute to oil spill risks of each country, is investigated. Measures taken to reduce and control oil pollution risks are examined especially existing oil spill preparedness measures and the legislative arrangements in each country to reduce, and control accidental oil pollution were taken into account when analyzing the oil spill control mechanisms in each country in the region.

The oil spill response capabilities of the regional countries are comparatively examined, using three main standard practices taking into account oil spill contingency practices; oil spill response equipment and support resources; and legislation and regulations adopted by each country. The exposure and preparedness index is used to examine the level of oil spill preparedness with comparison to oil pollution exposure of the country. Oil spill exposure and oil pollution preparedness levels are measured using parameters which give numerical values for oil spill exposure and oil pollution preparedness. The existing sustainable funding mechanisms for preparedness of oil spills are reviewed critically analyzing positive and negative points of available funding methods with a view to identify sustainable funding mechanisms for South Asian countries.

The dissertation critically analyzes existing oil spill response capabilities of the countries and recommends a number of measures to improve oil spill combat capability in the South Asian regional countries.

Key words: Oil Spill, Contingency Planning, Preparedness, Combat capability, Sustainable funding

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AMSA	Australian Maritime Safety Authority
BCG	Bangladesh Coast Guard
BOBLME	Bay of Bengal Large Marine Ecosytem
BP	British Petroleum
CLC	International Convention on Civil Liability for Oil Pollution damage 1992
EIA	Energy Information Administration
ESCAP	Economic and Social Commission for Asia and the Pacific
DWT	Dead Weight Tonnage
FUND	International convention on the Establishment of an International Fund for the Compensation for the Oil Pollution Damage
GESAMP	Group of Expert on Scientific Aspect of Marine Environmental Protection
ICG	Indian Coast Guard
ICM	Incident Command System
IEA	International Energy Agency
IMCO	Intergovernmental Maritime Consultative Organization
IMO	International Maritime Organization
IPA	Indian Port Association
IPIECA	International Petroleum Industry Environmental Conservation Association
ITOPF	International Tanker Owner Pollution Federation
IUCN	International Union for Conservation of Nature
MARPOL	International Convention for the Pollution prevention from Ship
MEFB	Ministry of Enviromentment and Forest Bangladesh
MEPA	Marine Environment Protection Authority

MNOC	Maldives National Oil Company
MOEP	Ministry of Environment and Petroleum
MPL	Maldives Port Limted
MPNGI	Ministry of Petroleum &Natural Gas Government of India
MPNR	Ministry of Petroleum and Natural Resources
MPPA	Marine Pollution Prevention Authority
MOU	Memorandum of Understanding
NMDCP	National Marine Disaster Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOSDCP	National Oil Spill Disaster Contingency plan
NOSCP	National Oil Spill Contingency Plan
PMSA	Pakistan Maritime Security Agency
PPP	Polluter Pays Principle
PQA	Port Qacim Authority.
OECD	Organization for Economic Cooperation and Development
OPRC	International Convention on Oil Pollution preparedness, Response and Cooperation
OSMPRMC	Oil Spill Management Project Review Management Committee.
SACEP	South Asia Cooperative Environment Programme.
SAARC	South Asian Associan for Regional Cooperation
UNCLOS	United Nations Convention on Law of the Sea
UNEP	United Nations Environment Programme
UNESD	United Nations Department of Economic and Sustainable Development

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Chapter 1
Introduction

1.1. Background

Oil is the dominant and the most important primary energy source in the world. The availability of crude oil and its refined products are a key economic driver behind all economic activities undertaken by society today (Burgherr, 2007). Fossil fuels provide more than 90 percent of the world's transportation and commercial energy needs of most of the countries in the world (Smil, 2000).

Although oil is very critical to the economic growth, oil reserves are not equally distributed among the countries of the world. According to the British Petroleum Statistical Review Report (2010), 54.4 percent of the world's proven oil reserves lie in the countries of the Middle East. These countries produce 30.3 percent of the total oil production while the United States, the European Union, and China account for half of the world's total oil consumption. The geographical isolation of oil producers and oil consumers necessitates that crude oil and refined products be transported across great distances from the producer to the consumer markets (Burgherr, 2007). Presently, almost 60 percent of the world's crude oil extraction is exported, while more than 130 countries import crude oil and refined products (Smil, 2000).

The present isolation of producers in locations where oil reserves lie and the location of the consumers along with the intensive use of oil worldwide has resulted in the development of increasingly complex sea transportation (Connolly & O'Rourke, 2003). Shipping has provided countries with an efficient and economical means of transport

especially for oil. Increasingly, however, marine transportation of oil has inevitably resulted in accidental oil spills. About two-thirds of the world's petroleum trade including that in crude oil and refined or processed products is carried on through ships along international sea lanes (BP, 2011).

Over the years, the amount of oil transported by ships has significantly increased as the world economies have expanded. In the past few decades, the safety and preventive measures introduced both, internationally and nationally, have reduced the number of spills and the quantity of accidental releases into the sea. The recent oil spill data also shows that the amount of oil spilled from ships has decreased.

However, recent incidents show that no one can predict an oil spill; yet, when it happens, its consequences can be far reaching. Marine oil spills are unpredictable events that may cause significant damages to the environment, the wildlife, and the coastal communities. Oil transportation has historically been responsible for many of the larger marine oil spills. More recently, there has been an increasing number of major oil spills occurring due to offshore exploration and production. The coastal states concerned, therefore, are mandatory required to take the necessary measures to respond to oil spills in an effective manner to reduce and minimize the environmental, economic, and social impacts of oil spills. Although ongoing work on preventative measures resulted in driving down the number of major spills, the risk cannot be reduced to zero.

The South Asian region comprises of five maritime nations including, Bangladesh, India, Maldives, Pakistan and Sri Lanka. The South Asian countries not only import much of oil for domestic consumption, but India, Maldives, Pakistan, and Sri Lanka lie close to the main shipping route that connects the Middle East to the Far East (ITOPF, 2005). Additional maritime oil spill risks arise from non-tanker shipping, carriage of refined products, offshore explorations and production operations. The South Asian region can be identified as a fast growing economic region and because of this; demand

for goods as well as oil consumption, has rapidly increased recently. As a result, oil spill risks have also reached alarming rates here.

Considering these risk factors, a South Asian Regional Oil Spill Contingency Plan was drafted under the auspices of the IMO in 2000 (SACEP, 2000). However, the Memorandum of Understanding (MOU) has not yet been signed. Therefore, in the event of a major oil spill, it would be difficult to obtain assistance from neighboring countries. The Tasman Spirit oil spill in Pakistan, in 2003, revealed the possibility of an oil spill occurring in the region and impacting the areas affected both, socio- economically and environmentally. After that accident, the countries in this region have taken several steps to strengthen their capabilities to combat and, if possible, prevent oil spills. However, the oil spill contingency management process is more reactive than proactive.

At this juncture, in order to minimize the possible environmental and socio-economic impacts due to oil spills, it is necessary to ascertain proper ideas regarding the levels of preparedness, combat capabilities, as well as the constraints and weaknesses of aforementioned five countries. It is deemed that any plan of this nature will be helpful in improving oil spill combat capabilities, as well as expedite planning of the process to overcome all possible impacts due to oil spills. Also, it is difficult to obtain adequate funding from the government to strengthen a country's oil spill combat capabilities. It is, therefore, essential to develop a sustainable funding mechanism using the Polluter Pays Principle (PPP).

1.2. Objectives of the Study

The objectives of this research are to:

- To describe and evaluate oil spill risks and potential environmental impact due to oil spills in the five maritime nations within the South Asian region

- To study and evaluate the present status of oil spill contingency arrangements of maritime nations of the South Asian region.
- To analyze the oil spill preparedness capabilities of the countries in the South Asian Seas.
- To study the present funding mechanisms for oil spill contingency management and suggest sustainable funding mechanisms for effective implementation of oil spill contingency management process in the maritime nations of the South Asian Region

1.3. Research Methodology

The study primarily used the qualitative approach by initially proceeding to collate information. However, in order to offer a clear picture of the findings, a quantitative assessment was also used. The oil spill risks faced by countries ware indentified by using the qualitative approach, and information related to the likelihood and consequences of the spills were collected and analyzed using the qualitative and descriptive approaches. After that, information related to individual countries' oil spill response arrangements was collected and analyzed, using a set of criteria to measure individual countries' oil spill response capabilities in comparison with other countries in the region. The Exposure and Preparedness Index was used to evaluate the adequacy of oil spill preparedness to face exposure to oil spills.

The sustainable funding mechanism is one of the major requirements for an efficient oil spill combat system, to be put in place. The available funding mechanisms for oil spill preparedness measures were collected and analyzed with the purpose of assessing the strengths and weaknesses of the different systems.

1.3.1. Data Collection

The author collected extensive data to fulfill the objectives of the research. The data were collected using different methods: the basic data was collected using the literature survey and after that, in order to fill the data gaps, a structured questionnaire was used to collect data from the five countries. Other than that, personal interviews were carried out to gather other information relevant to oil spill combat capabilities of South Asian countries.

1.3.2. Comparative Assessment Oil Spill Preparedness of South Asian Countries

The author identified three areas that affected the different countries' levels of oil spill preparedness and response. In order to assess each factor identified, a set of best practices was identified and scores were assigned for each standard. The analyzed results were presented in graphical form to give a clear picture. Three elements were selected for assessment.

These were:

- Contingency planning practices.
- Response equipment and supporting resources
- Legislation and regulation

After that, in order to measure the adequacy of oil spill preparedness levels with regard to a country's to exposure of oil spill risks, the author used the Exposure and Preparedness Index. A Set of parameters was used to measure the magnitude of exposure and the level of preparedness.

1.4. Structure of the Dissertation

The research work of the dissertation comprises of seven chapters. The first chapter covers the preliminary aspects of research work with a background to the topic. The

second chapter presents the impact of oil spills and the action taken by the international community to prevent and control oil pollution. This includes technical and legislative arrangements. The third chapter analyzes the oil pollution risks faced by each country in the South Asian region and the contributory factors to the oil spill risk. Chapter four evaluates the present oil spill preparedness and legislative arrangements in each country of the region. Chapter five analyzes the oil spill preparedness and response capabilities in each of the countries using the Comparative Assessment Approach. Chapter six examines the international environmental principle and international legal regime relevant to the funding for oil spill preparedness and describes the funding mechanisms in place in different countries available to finance the oil spill preparedness. Finally, it suggests a suitable funding mechanism for the countries in the South Asian region. Chapter seven, the concluding chapter, provides the conclusions arrived at by the author after analyzing collated all information and data. Further, the last part of this chapter introduces various recommendations to overcome the present gaps and weaknesses relevant to the problems of oil spill preparedness in South Asian countries.

Chapter 2

Challenges of Oil Spills and International Response to Oil Pollution

2.1. Oil Input from Different Sources

Oil is important as a main source of energy at present and it will remain as a main energy source for decades. Fossil fuels provided 34 percent of the world's primary energy demand in 2009. The present world's oil production is 9Mb per day (IEA, 2010a). Due to population growth and economic development, the demand for primary energy is expected to increase by 36 percent between 2008 and 2035 or by 1.2 percent per year on average (IEA, 2010b). Oil will remain as the major primary energy source for decades and oil production peak at 89 Mb per day just before 2020 (IEA, 2010a). In addition, by the year 2020 the world's oil consumption will have increased more in developing countries than oil consumption of industrial countries (See Figure 1).

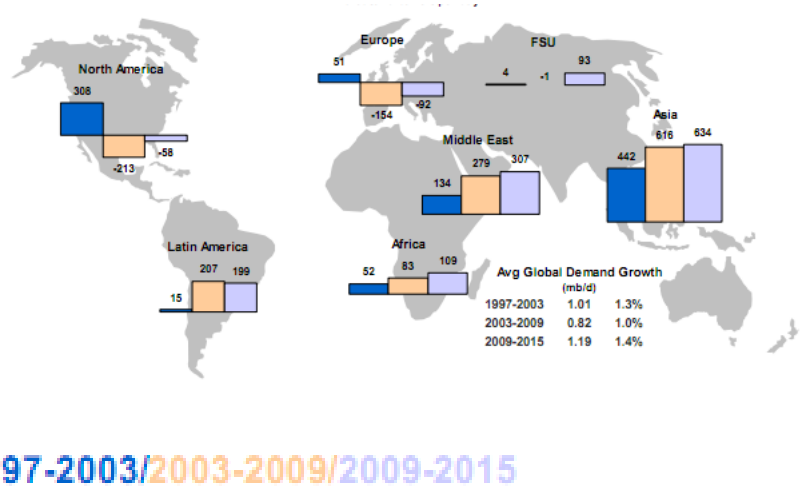

Figure 1: Average global oil demand growth from 1997 to 2015

Source: Medium term oil and gas market, 2010

This clearly indicates that international trade of oil will increase and it will further increase oil movement by sea (See Figure 2). Eventually this will increase the possibility of oil to be spilled at sea. The possibility that oil will be spilled at sea is therefore very real and may even be increasing in the foreseeable future.

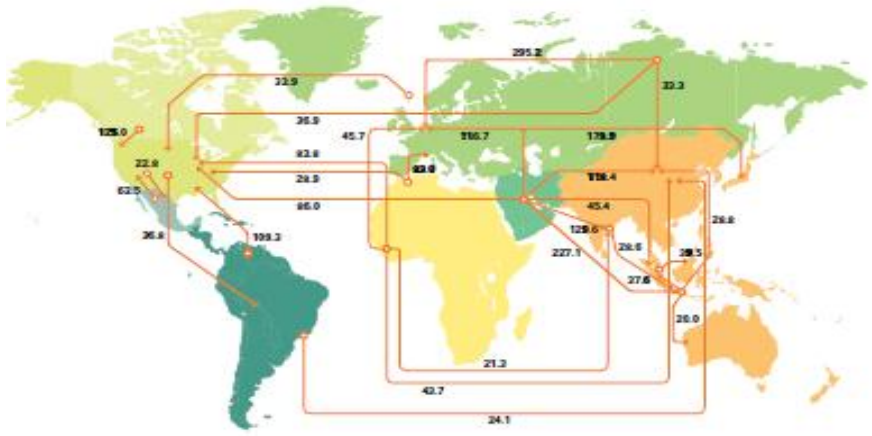

Figure 2: Worldwide oil movements, 2010

Source: BP Statistical review world energy June 2011

The input oil into the marine environment has been estimated by different agencies. However, there are some uncertainties regarding estimation of oil input to sea by different sources due to non availability of data. According to the estimation of GESAMP[1], the total amount of oil entering the marine environment from ships and other sea based activities is 1.245 million tonnes per year and from which the shipping sector contribution is 36 percent. The greatest shipping inputs are from operational discharges which account for 27 600 tonnes per year. Shipping accidental discharges account for 163 000 tonnes per year (GESAMP, 2007). However, According to National Research Council the total amount of oil input to the sea by various sources is 1.3.million tonnes

[1] The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) is an advisory body, established in 1969, that advises the United Nations (UN) system on the scientific aspects of marine environmental protection

and from which, 30 percent of oil enters to the marine environment from marine transportation (NRC, 2003).

According to ITOPF (2011a) information, in the past three decades number of accidents and amount of oil released into the marine environment has decreased significantly due to actions taken by international organizations and national agencies. Causes for the oil spills resulting from shipping accident were obtained from ITOPF (See Figure 3).

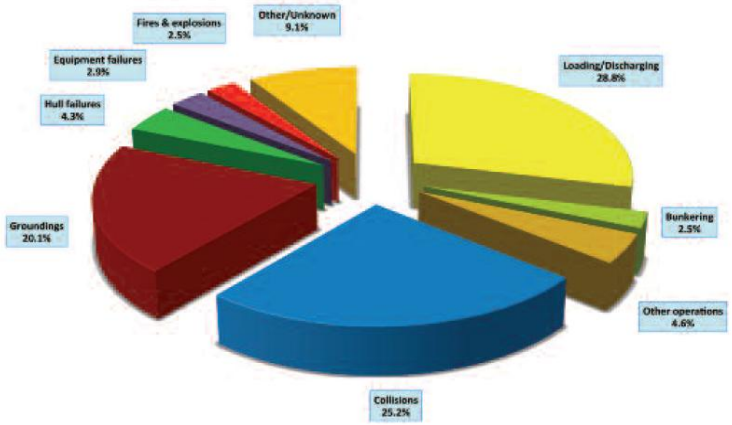

Figure 3: Causes for the intermediate oil spills (7-700 tones), 1970-2010

Source: ITOPF handbook 2010

According to information provided by ITOPF (2011a) for the period of 1970 to 2010, the most common cause for oil spills is loading and unloading (See Figure 4).

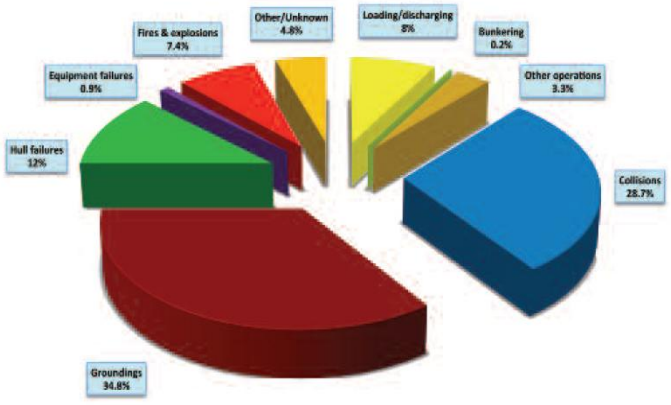

Figure 4: Causes for the large oil spills (>700 tonnes), 1970-2010

Source: ITOPF Handbook 2010

More than 28 percent of smaller oil spills less than 700 tonnes occurred due to grounding of ships, while the main common cause for the large spills is groundings and collisions. Accidents are unpredictable and they occur for different reasons. The oil input due to major ship accidents differs from year to year and if a major tanker oil spill occurs, the amount of oil released into the marine environment is increased significantly. The amount oil transported by ships as well as ships size has dramatically increased in the past two decades. This will further increase the potential release of accidental oil spills into the sea.

2.2. Types of Petroleum Oil and Chemical Composition

Crude oil and its refined products are a mixture of hydrocarbons generated by natural processes. Crude oil contains a complex mixture of thousand of different chemical compounds. The hydrocarbon compounds have different behaviors ranging from very volatile, light materials to more complex heavy compounds. The amount of hydrocarbon in crude oil is as high as 95 percent and the toxicity degradability is different. Each type of oil has special properties. The most important properties of oil are specific gravity, viscosity, distillation characteristics and pour point (ITOPF, 2003).The fate and behavior of oil in the marine environment mainly depend on the above characters. According to the specific gravity of oil, it can be divided into four groups.

2.3. Process which Affect Released Oil into the Marine Environment

When oils are released into the marine environment, they are subject to a process of chemical and physical changes. Collectively this process is called a weathering process. These processes determine the ultimate fate of oil in the marine environment. Oil undergoes eight processes when released to the marine environment: spreading,

evaporation, emulsification, dissolution, oxidation, sedimentation, dispersion and biodegradation. The processes are shown Figure 5.

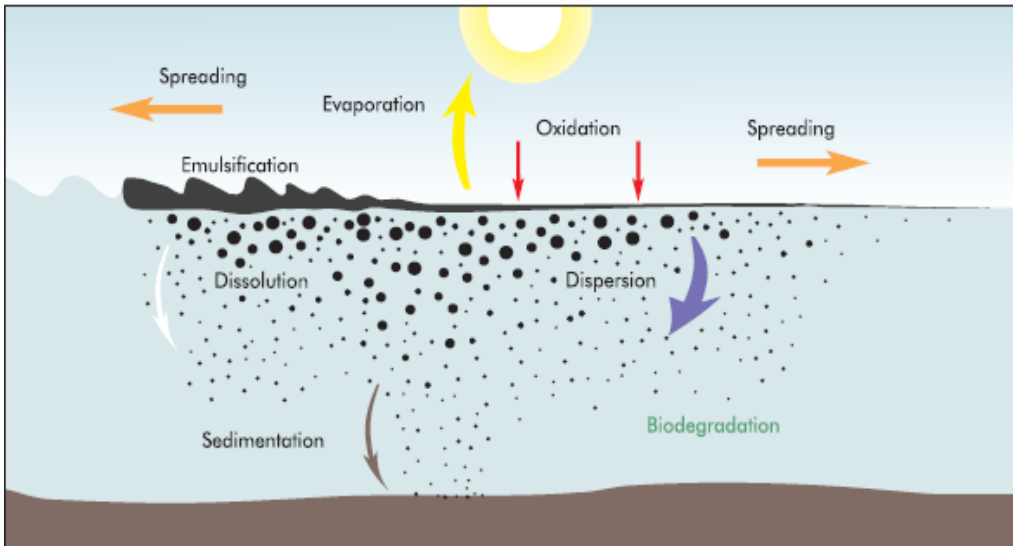

Figure 5: Oil weathering process

Source: ITOPF Handbook, 2010

2.4. Factors Affecting the Fate of Spilled Oil

The rates of the weathering process depend primarily on certain specific properties of oil. This process to some extent depends on the prevailing weather. Spreading is the most immediate obvious process. Spreading mainly depends on oil properties specially density and viscosity. Viscosity mainly depends on the environmental temperature. According to Cormack (1999) spreading of oil can be divided into three phases. The first phase is mainly driven by oil density driven forces. Rate of spreading at any instances will be proportional to slick thickness. After that the second phase of spreading is driven by density as well as viscosity forces. Finally, in phase three, spreading is in micron range. In addition, spreading depends on other environmental factors such as wind and tidal or current vectors. Due to action of wind, oil slicks break up into ribbons aligned

with wind directions. Slick movement is based on the whole value of tidal or current speed with 3 percent of wind speed (ITOPF, 1987).

Evaporation of oil also mainly depends on oil properties and environmental conditions. Some light oil contains high volatile compounds and after released into the environment, these compounds evaporated to the atmosphere. Further, the evaporation rate depends on the vapor pressure of its volatile components and the concentration of its vapour is present in atmosphere (Ross & Buist, 1995). Subsequently air temperature and wind speed will affect the rate of evaporation.

When oil is spilled into water, oil weathers and gradually mixes with sea water to form stable water in emulsion. Most of the crude oil emulsifies when mixed with sea water because most of the crude oil contains natural emulsion stabilizing surfactant for example, asphaltines and resins (Ross & Buist, 1995). Some crude oil starts emulsification immediately when released to the environment and others emulsify only after evaporation of volatile compounds. Emulsification increases the volume of oil present in water and renders it much more viscous.

2.5. Effects of Oil on the Marine Environment

Oil spills can have a serious effect on the marine environment as well as economic activities in coastal and marine areas. However, there is an argument that effects of oil in the environment is not directly related to the volume of the spill; it depends on properties of spilled oil, weather conditions, seasons, and the nature of the physical and biological environments. Extensive research shows that many components of the ecosystems are highly resilient to short term adverse changes and therefore, the short term effect of oil spills on the marine ecosystem and coastal communities are well known and obvious (Dicks, 1999). However, the long term effect of oil spills on the marine ecosystem is the effects of oil on marine life which are caused by physical nature or by the chemical components of the oil.

One of the most visible environmental effects of major oil spills is seabird mortality (Heubeck, et al., 2003). Seabirds are particularly vulnerable to oil spills. Species that dive for their food or which gather together on the sea surface are particularly at risk. The main reason for bird mortality is from drowning, starving and loss of heat due to damage to the plumage by oil. Bird mortality occurs during most spills and in some major spills breeding colonies have been seriously depleted. Some species react to colony depletion by laying more eggs, breeding more frequently or younger birds joining the breeding group (Heubeck, et al., 2003).

Oil can come into contact with coral reefs in different ways when oil is released to the marine environment. Shallow water coral reefs are exposed to air during low tides. When oil spills occur a coupled with low tides, they can cause direct contact with oil. Also, another mechanism involves waves breaking on the reefs', it makes droplets of oil that are spread into a water column and come into contact with the coral reef. The direct exposure of coral reefs can cause smothering. Studies have shown that oil pollution can cause long term impacts as well as short term impacts on coral reefs. Long term research in the Red Sea has shown that a steady chronic discharge of oil into coral reef areas can decrease colonization, decrease viability, cause coral mortality and many other changes (IPIECA, 1992).

Past oil spills and field and laboratory studies have shown that often oil harms or kills mangroves (NOAA, 2010). Oil can enter mangrove areas when the tide is high. Then tides are receded oil can be deposited in the mangrove root system and sediment. This process can lead to deposits oil slicks in different areas of mangrove forests as patches due to tide differences in different areas. Mangroves can be affected in two ways in an oil spill situation. Crude oil and heavy fuel oil can be deposited on mangrove roots and sediments as thick sticky layers. This may inhibit or completely prevent the normal biological process. The physically covered mangroves can be destroyed due to suffocation, starvation or other physical disturbances of biological function. In addition,

acute or chronic toxicity of the oil accelerates the physical smothering (IPIECA, 1993). Mangroves can also be chronically impacted by oil in several ways, such as growth rate reduction, and alter reproductive production.

2.6. Effect of Costal Economy and Health

Oil spills can have a huge economic impact on coastal activities. Fishery and aquaculture can be impacted in several ways due to oil spills. Commercially available fishing resources can be smothering or killed as result of toxicity of oil. Fishing cannot take place in contaminated areas due to possibility to damage fishing gears and tainting of the catch due to contact with oil. When there is oil on beaches and coastal areas, fishermen can not engage in fishing. Interruption of fishery activities and aquaculture practices can have a significant economic impact on coastal communities. However, the impact depends mainly on the physical properties of the oil rather than its toxicity (ITOPF, 2004). Past oil spill data has shown that the economic impact of fishery sector is very high. After the Prestige oil spill, Spanish authorities carried out research to identify the economic impact on the fishery sector. It showed that the economic impact on the fishery sector of Spain was extremely high and cost more than 70 million Euros. (Garza-Gil, Suris-Regueiro, & Valera-Lafuente, 2004).

Moreover, the petroleum hydrocarbons may also have a direct impact on human health, but good data on the risks to human health from oil spills is limited. Some recent studies have shown that oil spills may have direct impact on human health. For example, the oil spill in the Gulf of Mexico posed direct threats to human health from inhalation or dermal contact with the oil and dispersant chemicals, and indirect threats to seafood safety and mental health (McCoy & Salerno, 2010). The main components of crude oil are aliphatic and aromatic hydrocarbons. Lower-molecular-weight aromatics are volatile organic compounds and evaporate within hours after the oil reaches the surface. Volatile organic compounds can cause respiratory irritation and

central nervous system depression. Benzene is known as to cause leukemia in humans. (Solomon & Janssen, 2011). According to Cormark (1999) oil spills cause more economic damages on coastal economic activities; therefore, the economic effects are the true reasons for oil spillage response and they are perfectly sufficient reasons for maintaining a high level of preparedness to deal with oil spills for cost effective reasons.

2.7. International Legal Regime to Prevent Oil Pollution and compensate pollution damages

In the previous sections, the oil transportation by vessels, amount of oil added to the sea from accidents, causes and reasons for oil spills and environment and socio economic impact due to oil spills were described. In this sections development of an international legal regime to reduce oil pollution from ships, important international conventions for the reduction of oil pollution and oil pollution liability regime developed to compensate damages will be described.

2.7.1. Development of an International Legal Regime for Oil Pollution from Ships

The first oil tanker in the world started operating in the late nineteenth century (Luoma, 2009). After that oil transportation and size of the vessel increased substantially due to energy demand. While oil transportation increased by ships, the potential for oil pollution has also been increased (IMO, 2009). Oil pollution from ships was first recognized as a problem after the First World War; hence, action against oil pollution initiated early part of the twentieth century (IMO, 1996). The first international attempt to address operational oil pollution from ships was at the Washington DC Conference in 26 June 1926 (Tan, 2005). In order to reduce operational oil discharges from ships, a convention was drafted; however, this convention was never adopted. After the Second World War, it was clear that oil transportation caused a risk for pollution of the sea. To take necessary measures the United Nations (UN) convened a Maritime Conference in Geneva which resulted in the establishment of Intergovernmental Maritime Consultative

Organization[2] (IMCO) in 1948. First multilateral oil pollution control convention was the "International Convention for the Prevention of the Pollution of the Sea by Oil (OILPOL) was adopted in 1954. OILPOL 1954 came into force on 26 July 1958. By the time the IMCO Convention entered into force, depositary responsibilities of OILPOL 54 were transferred to IMCO by the United Kingdom in 1959 (Tan, 2005). After the Torrey Canyon oil spill incident, which resulted spilling 120 000 tonnes of oil into the sea, IMO introduced several conventions related to oil pollution prevention from operational discharges, accidental discharges as well as liability regime for damages of pollution.

2.7.2 .International legal Regime Related to Oil Pollution Prevention from Ships

The major conventions developed by IMO related to oil pollution prevention from operational and accidental discharges as well as details of other relevant conventions are described below.

2.7.3. International Convention for the Prevention of Pollution from Ships (the "MARPOL Convention 73/78")

MARPOL 73/78 is one of the most important international marine environmental conventions. The objective of this convention is to protect the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharge from ships. The Convention includes regulations aimed at preventing and minimizing pollution from ships both accidental pollution and a regular operational pollution. The most important regulation relevant to prevention of accidental pollution is Regulation 13F. It introduced double hull

[2] Inter-Governmental Maritime Consultative Organization (IMCO), was established in Geneva in 1948, and came into force ten years later in 1959. The IMCO name was changed to IMO in 1982.

requirement for tankers. 1993. Also, Regulation 26 of Annex I introduced a requirement for an oil pollution emergency plan on board requirement for every oil tanker. These two amendments are very important to reduce risk of accidental oil spills and to minimize their consequences.

2.7.4. The International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (the "Intervention Convention")

The "Intervention Convention" was adopted in 1969. It has given the right to coastal states to take such measures on the high seas as may be necessary to prevent, mitigate or eliminate danger to its coastline or related interests from pollution by oil or the threat thereof, following upon a maritime casualty. However, the coastal State is empowered to only to take action when it is necessary, and after due consultations with appropriate interests. A coastal State which takes measures beyond powers given by convention is liable to pay compensation for any damage caused by such measures.

2.7.5. The International Convention on Salvage (the "Intervention Convention")

The "Salvage Convention" was adopted by IMO in 1989 and entered into force in 1996. The new convention replaced a convention on the law of salvage adopted in Brussels in 1910. The Brussels Convention on the Law of Salvage includes the principle of "no cure no pay" under which a salvor is only rewarded for services if the operation is successful. Although this principle is applicable in most of the cases, it was recognized that this principle did not function well in incidents that pose a risk of pollution. As there was no incentive for prevention of pollution, payment was paid only if the salvor managed to save the ship and/or cargo. The 1989 Convention included remedy for this shortcoming by introducing provisions for enhanced salvage award taking into account the skill and efforts of the salvors in preventing or minimizing damage to the environment.

2.7.6. The International Convention on Oil Pollution Preparedness, Response and Co-operation (the "OPRC Convention") of 1990.

This important convention regulates the marine pollution arising from accidental oil spills. The "OPRC Convention" came into force in 1995. The main objectives of the convention are to facilitate international cooperation and mutual assistance in preparing for and responding to major oil spills and encourages States to develop adequate capability to deal with oil pollution incidents. The preamble of convention recognizes the "polluter pays" as an international principle for environmental law. The "OPRC Convention" introduced several measures to improve oil spill combating capabilities at a country level as well at a regional level. The major obligations of the parties to the convention are: Parties to the convention shall establish a national system for responding promptly and effectively to oil pollution incidents, Each Party with help of all stakeholders shall establish: a minimum level of pre-positioned oil spill combating equipment, a programme of exercises for oil pollution response and training of personnel, and parties shall take action to conclude bilateral or multilateral agreement for oil pollution preparedness or response.

2.8 International Legal Instruments related to the Compensation for Damages caused due to Oil Spills

The importance of compensation for the damages caused due to oil pollution was recognized when the Torrey Canyon occurred in British waters (Kiran, 2010). After that incident two voluntary agreements and two conventions were developed. Compensation is available under these instruments for the damages occurred and cost incurred for cleanup as a result of a spill of persistent oil from a tanker (IPEICA, 2007).

2.8.1. The International Convention on Civil Liability for Oil Pollution Damage (The "CL Convention")

The CL Convention was adopted in 1969 and entered into force in 1975. The Convention was amended in 1992 by a Protocol of 1992 which entered into force in 1996. The 1992 Protocol increased the compensation limits and widened the scope of the Convention. The Convention ensures that adequate compensation is available to parties that suffer oil pollution damage resulting from maritime casualties involving oil-carrying ships. The Convention places strict liability on the ship owner subject to a number of specific exceptions. It is the duty of the owner to prove in each case that any of the exceptions should in fact in place. The Convention requires ships covered by it to maintain insurance or other financial security in sums equivalent to the owner's total liability for one incident. The Convention applies to all sea going vessels carrying oil in bulk as cargo, but only ships carrying more than 2,000 tons of oil are required to maintain insurance in respect of oil pollution damage (IMO, 2011).

2.8.2. The International Convention on the Establishment of an International Fund for the Compensation for Oil Pollution Damage 1971 (the "Fund Convention")

The "Fund Convention" adopted in 1971 entered into force in 1978. The International Oil Pollution Compensation Fund (IOPC) was established in 1971 in order to administer the Fund. The main purposes of the Fund Convention are to provide compensation for pollution damage to the extent that the protection afforded by the 1969 Civil Liability Convention is inadequate, to give relief to ship-owners in respect of the additional financial burden imposed on them by the 1969 Civil Liability Convention, to give effect to the related purposes set out in the Convention. The annual contributions to the funds are coming from levies on companies that received contributory oil[3] in the countries

[3] Crude oil and fuel oil as define in the Fund Convention

which are parties to the Convention. The Convention was amended through the 1992 Protocol. In addition, a supplementary fund was created in 2003 in order to make sure that sufficient amount of compensation will be available for victims of oil pollution incidents (IMO, 1998).

2.8.3 The International Convention on Civil Liability for Bunker Oil Pollution (the "Bunker Convention")

The "Bunker Convention" adopted in 2001 and entered into force in 2008. The main purpose of the convention to ensure that adequate, prompt, and effective compensation is available to parties that suffer damage caused by spills of oil, when carried as fuel in ships' bunkers.

2.9. Oil spill Response Methods and Contingency Planning

As long as society depends on oil, oil spills can occur any time mainly due to the potential of human error and equipment failure inherent in producing, transporting, and storing petroleum (Fingas, 2001). It is vital to introduce ways to prevent oil spills, in the meantime, methods for responding to oil spills need to be deployed in order to minimize oil pollution impacts. The main purpose of oil spill response is to minimize the consequences of oil pollution incidents. The oil spill response method can broadly be divided into four types: mechanical, chemical, bioremediation, in situ burning (Etkin, 2000). Oil spill response methods can widely be divided into four groups. Brief details of the above methods are given below.

2.9.1. Mechanical Response Methods

The main objective of most of the mechanical methods is to remove oil from the environment. Containment and recovery of oil in water are the main methods. The containment of floating oil can be done by using physical barriers. Containment booms are most frequently used for containment (Fingas, 2001). After containment of oil slick

using booms oil can be removed from the sea surface using skimmers. Skimmers can be classified into different types according to operating principles (Fingas, 2001). Other than skimmers, sorbent materials can be used to remove oil from water surface. However, the effectiveness of use of this equipment in open waters mainly depends on properties of oil and environmental conditions.

When the oil reached to coast, the shoreline cleanup methods need to be deployed. It is difficult to contain and recover most of the oil at sea; many oil spills have resulted in contamination of the shoreline. Oil reaching the shoreline has great environmental and socio economic impacts. It is therefore needed to remove oil as soon as possible from the shore line (ITOPF, 2011).There are various types of shoreline cleanup methods; most of which have environmental impacts. Hence, the selecting shoreline cleanup methods are necessary the kind of trade off of the effects oil versus the effects of the cleanup should be focused on.

2.9.2. Chemical Response Methods

Dispersants is the common name used to label chemicals that are used to treat the oil. The dispersants alter the physical behavior of oil on the sea surface. Dispersants consist of a mixture of surface active agents and solvents. The dispersant deduce the surface tension of oil droplets and improve solubility of oil in water. However, the decision to use dispersants should be made after a comparison of environmental cost benefit analysis (IMO, 2005).

2.9.3. Bioremediation

Biodegradation agents are used mostly to accelerate the biodegradation of oil in the environment. These agents are not effective when used at sea, because they are primarily used on shorelines or land.

2.9.4. In Situ Burning

The intentional control burning of spilled oil on the sea surface is called in situ burning. The major advantage of in situ burning is ability to remove large quantities of oil in a short period of time. However, use of in situ burning is limited and there are two main issues related to this method: production of a large and dense, black plume of smoke, and the residues that remain after the burning (IMO, 2005).

2.9.5. Oil Spill Contingency Planning

Oil spills like most other environmental emergencies are not predictable and can occur any time. Therefore, in order to respond to an oil spill careful planning is required. Oil spill contingency planning requirements have been recognized since 1969. The United States first introduced requirements of vessel response plans through the Oil Pollution Act1990 (Veiga, 2003). Five years later OPRC Convention entered into force and introduced requirements of the National Oil Spill Contingency Plan as well as Regional Oil Spill Contingency plan requirements.

The main objective of oil spill contingency planning is to prevent, control or minimize environmental, social and economic impacts due to oil spills. It is widely recognized that contingency planning leads to response to oil spill incident in an effective and efficient manner. The purpose of an oil spill contingency plan is to coordinate all aspect of the response to an oil spill. The contingency plan mainly consists of three sections: strategy section, operational section and data directory. The strategy section includes scope of the plan with geographical coverage, perceived risk, role and responsibilities of all involved agencies, and the proposed response strategy. The operation section includes the emergency procedures which will allow rapid assessment of the oil spill and speed mobilization of response equipment. Data directory includes all maps, resources list, and other supporting data which are required to respond to oil spill as per agreed response strategy (IPIECA, 2000). The effectiveness of response to the major oil spill events

ultimately depends upon the quality of the contingency plan (ITOPF, 2011). Therefore, good contingency planning is the key element of oil spill preparedness, which should be regularly tested and updated to increase the effectiveness of plan. In addition, regular training of personnel at all level and testing of oil spill combat equipment is important to ensure level of preparedness (ITOPF, 2011).

Chapter 3

Risk of Oil Pollution in The South Asian Region

3.1. Introduction

The Five maritime nations in the South Asian region which can be divided into two different geographical groups; Two nations, the Maldives and Sri Lanka are island nations; Bangladesh, India and Pakistan are part of the Asian mainland (See Figure 6). South Asia is endowed with a long coastline of over 100 thousand km with high population density along much of the coast (UNEP, 2003). The coastlines of South Asia that forms a part of Bangladesh, India, Maldives, Pakistan and Sri Lanka are highly prone to oceanogenic, hydro-meteorological, seismic as well as manmade disasters.

Figure 6: Five Maritime Nations in the South Asian Region

The identification of risk of oil pollution is very important to answer the question of "prepared to respond to what" (IMO, 2010). Therefore, the risk of oil pollution from accidental or operational discharge is needed to be considered when reviewing the oil spill response capability. This section is going to identify relative oil spill risks faced by each country in the region.

3.2. Oil Pollution Risk and Factors Influence on Risk

Risk is the combination of likelihood and consequences of an undesirable event. In order to determine the level of risk, it is necessary to answer the following questions: what can go wrong? How likely is it?, and What are the impacts? . The process of answering these questions is called risk analysis. In the risk assessment process, it is necessary to use different types of analytical methods to identify and assess hazards and risks. To control risks two types of mechanisms can be applied: First the reduction of likelihood or frequency of accidents, Second reduction of the consequences of accidents. One of the important measures to reduce the consequences oil spill accidents is to develop an oil spill contingency plan to response oil spill effectively (See Figure 7).

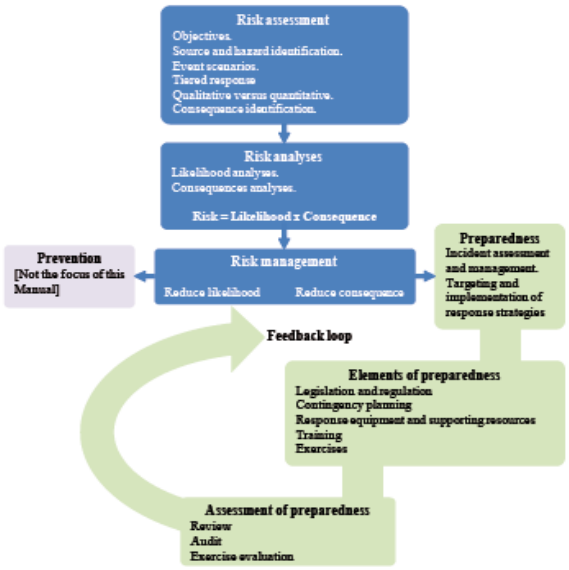

Figure 7: Overview of risk assessment and management, preparedness development and assessment process

Source: Manual on Oil Spill risk Evaluation and Assessment of Response Preparedness, International Maritime Organization (IMO), 2010

Further, when identifying oil spill risks in the South Asian region, it is necessary to identify all factors which affect the likelihood of an oil spill and the consequences of the oil spill. Factors affecting oil spill probabilities and consequences of incidents need to be analyzed to identify relative risks between different geographical locations in the South Asian region.

3.3. Frequency of Passing Ship Movement in the South Asian Waters.

South Asia Regional countries import much of its own consumption of oil and India, the Maldives, Pakistan and Sri Lanka situated close to the main shipping route from the Middle East to the Far East. The amount of oil passing though the Exclusive Economic Zones is very high. The South Asian region water is one the highest oil transporting routes in the world. Most of the oil tankers which transport Middle East to Far East countries sail through this region.

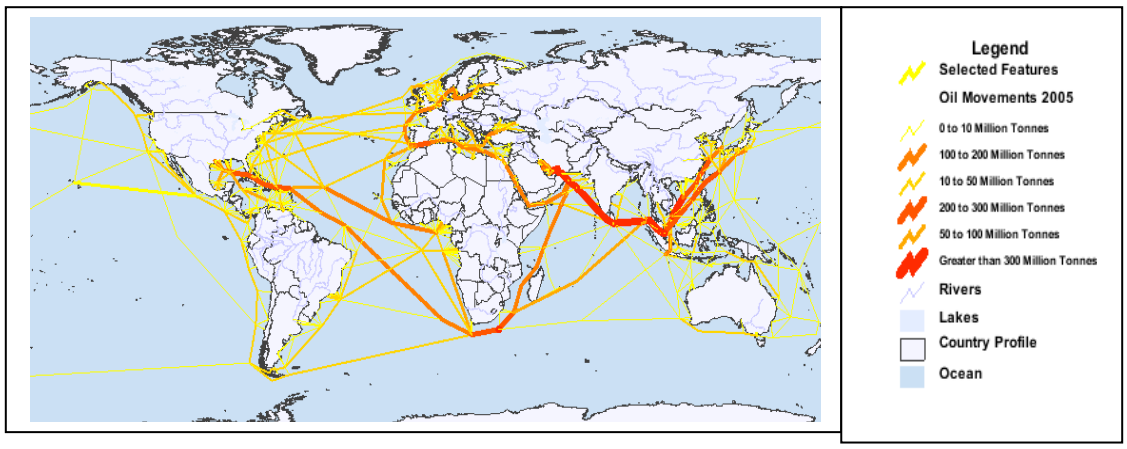

Figure 8: Oil movements on the Sea

Source: http://www.itopf.com/website/ITOPFWebGIS/viewer.htm, 2005

Figure 8 clearly shows that the amount of oil transported through the South Asian region is the highest in the world. More than 300 million tonnes of oil is transported across the South Asian seas region (ITOPF, 2005). There are few restrictions and most tankers in transit pass far away from the coasts. However, in two areas passing ships come closer

to the coast namely, Cape Comoron in India and off Dondra Head in Sri Lanka. Therefore, other than two regions, most of the region oil spill accident frequencies are low due to passing ships.

3.4. Shipping and International Trade in Countries in the Region

Additional maritime oil spill risks arise from non-tanker shipping, carriage of refined products, offshore exploration and production operations, and the transfer of oil cargoes at sea. The South Asian region can be identified as a fast growing economic region and due to this reason demand for goods as well as oil is rapidly increasing. Therefore, oil spill risks are also increasing at alarming rates in this region. In the following section an attempt will be made to identify oil spill risks for each of the South Asian countries considering factors which contribute to the risks such as number of vessel movements, quantity of oil unloading and loading, number of ports and terminals in each country, offshore oil exploration and exploitation. In addition, past oil spills and consequences of oil spills will be discussed in detail for each country risk profile.

3.5. India

3.5.1. Oil Import

With a high economic growth rate and over 15 percent of the world's population India's energy consumption is high. India was the fourth largest oil consumer in the world in 2011 (BP, 2011). India oil a requirement are around 3 300 thousand barrels per day in 2011 and it is expected to grow 1.8 percent annually (IEA, 2010a). More than 70 percent of the oil requirements of India are imported from Middle East countries mainly from Saudi Arabia and Iran (IEA, 2010b). Figure 9 shows the India's crude oil consumption and production from year 1980 to 2009.

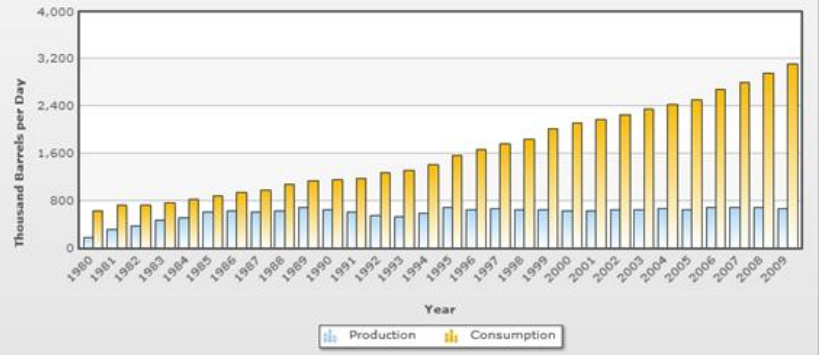

Figure 9: India crude oil production and consumption from 1980 to 2009

Source: United States Energy Information Administration, 2010

3.5.2. Details of Oil Handling Ports in India

The crude oil and other petroleum products totaling nearly 175 million tonnes are handled at major ports of India (See Figure 10). Estimate of the crude oil import is likely to be increased in the future shows a yearly increase of around three percent (MPNGI, 2010). This means that number of oil tankers which arrive to Indian waters to unload of crude oil is likely to increase significantly in the future. There are more than 24 oil handling facilities on the coastline of India (OSMPRMC, 2003)

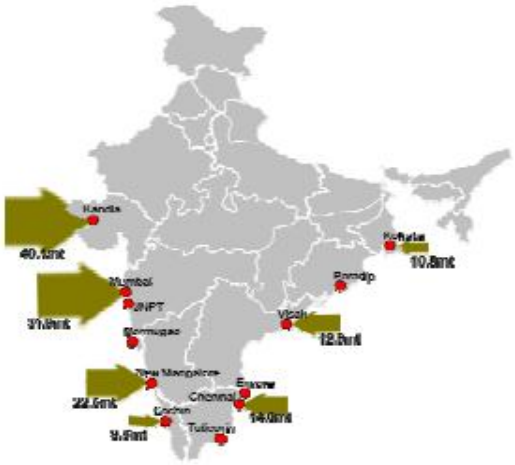

Figure 10: Crude oil and other Pol. Product handle by major ports in India in 2007

Source: Indian Port Association.

Past oil spill data show that most of the oil spills occurred during loading and unloading of oil (ITOPF, 2008). Therefore, there is high likelihood that oil spills will occur in Indian waters during loading and unloading of oil.

3.5.3. Vessel Traffic in Indian Ports and Waters

Figure 11: Major ports in India

Source: Indian Port Association

Other than oil, India imports large volumes of goods from other countries. Recent rapid economic growth has also increased the export significantly. There are 13 major ports[4] (See Figure 11) and 29 minor ports[5] in India (OSMPRMC, 2003). The number of vessel arriving to Indian ports is very high, in 2008 and 2009 are 20 668 and 21 251 respectively (IPA, 2010).

[4] Major ports- come under the administrative control of Central Government
[5] Minor ports- administered by State Government

3.5.4. Offshore Oil Fields and Oil Handling Facilities along the Indian Coastline

In addition to importation of oil, India produces oil from own oil fields. The country has proven oil reserves of least 1 200 million tonnes of crude oil reserves of which about 50 percent are in offshore oil fields. The total crude oil production was about 34 million tonnes in 2009. This amount is somewhat higher than in 2008 (MPNGI, 2010). India has accelerated oil production to cater for its huge demand for oil. Presently, there are 443 oil and gas fields in India, among them 145 oil fields are in coastal waters or in offshore deep waters. These oil fields produced 33 million tonnes of crude oil during 2009 (MPNGI, 2010).

3.5.6. Past Oil Spill Incident in Indian Waters

The large number of ships movements resulted in a significant number of oil spills in Indian waters during the past 20 years. Most of the oil spills occurred during South - West monsoon periods. Looking at the geographical differences in the country, the number of oil spills along the west coast is clearly higher than that along the east coast (Sivadas, Gregory, & Ingole, 2008). Seventy percent of the historical oil spills have in fact occurred along the west coast of India. Oil spill incident data show that oil spill incidents have decreased globally since 1970 (Burgherr, 2007). However, oil spill accidents in Indian waters have increased along the Indian coast during the past 35 years (See Figure 12). This may be mainly due to trade liberalization policies in India and recent economic growth of India has resulted in significantly increasing traffic of vessels in Indian waters.

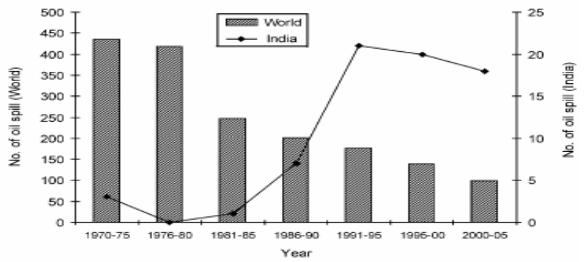

Figure 12: Comparison of oil spill incident in Indian waters from 1970 to 2005

Source: Current Science, 2008

Most of the oil tankers from Middle East countries pass along the west coast of India. Oil tankers which transport oil to western countries as well as Far East countries pass though the West Indian Ocean and large number of major and minor ports are located on the west coast of India. This is an explanation why the traffic densities in the western Indian waters are so much higher than those in the eastern Indian waters (See Figure 13).

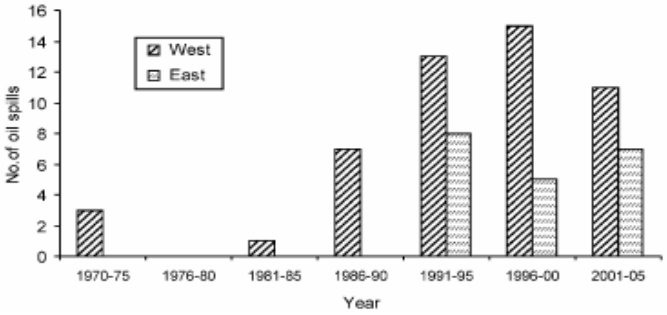

Figure 13: Comparison of oil spill in west coast and east coast from 1970 to 2005

Source: Current Science, 2008

3.5.7. Potential Consequences due Oil Spill in Indian Waters

There is possibility that accidental oil pollution will occur in Indian waters and that can pose a serious impact on the marine environment, maritime industries and coastal community in India. The Indian coastline is approximately 7 500 km long of which the main land accounts for 5 400 km and Lakshadweep and Andaman and Nicobar Islands accounts for 150 km and 200 km respectively (Venkatharaman, 2008) The Exclusive

Economic Zone is 2.02 million km^2. The Indian sub continent is facing the Arabian Sea along the west coast and the Bay of Bengal in the east. The coastline of India spreads across the 10 coastal states and seven Union territories (Rajagopalan, 2008).

India has a variety of coastal and marine ecosystems including considerable nationally and globally significant biodiversity. The coastal and marine ecosystems are very important from an economic perspective, since they supply a wide range of goods and services to the entire country. There are two geographically quite separated coral areas: the Gulf of Kutch in the northwest and the Palk Bay and the Gulf of Mannar in the southeast (Keller, Bleakley, & Well, 1995). The Lakshadweep Island along with the Maldives and the Chagos Archipelagoes form a chain of coral atolls and reefs on a contiguous submarine bank covering a distance of over 2 000 km (Hoon, 1997).

Mangroves ecosystems are found along large parts of the Indian coastline. Mangroves in India comprises for about five per cent of the world's mangrove forest with an area of close to 4 500 km^2. There are at least 17 major lagoon systems along the coast of India and extensive sea grass beds are also found in the east and west coast of India.

3.5.8. Ecological Sensitive Area in Indian Coastline

When oil spills occur, there will be impacts on the marine environment as well as coastal economy. Thirty two locations have been identified as sensitive areas because of their ecological sensitivity, commercial and recreational importance, and historical importance (ICG, 2006a). Special priority has been given to protection of these sites against oil pollution (See Figure 14).

Figure 14: Map of ecologically sensitive and other important areas to be protecting in oil spills in Indian coastline

Source: Indian Coast Guard, 2006

3.6. Bangladesh

Bangladesh consists of a land area slightly over 144 000 km^2 and a coastline of 910 km. Coastal and marine areas play important role in the Bangladeshi economy.

3.6.1. Port Operations in Bangladesh and Oil Pollution Risk

There are two major ports in Bangladesh, Chittagong and Mongla. The Chittagong Port is the main port of Bangladesh and it is situated on the right bank of the river Karnafuli at a distance of about 9 nautical miles from the shoreline of the Bay of Bengal. Mongla Port is situated at the east bank of Pussur River near the confluence of Pussur River and Mongla Null.

Table 1: Number of vessels arrived for the Chittagong port in last five years

year	Number of Ships arrived	
	Chittagong	**Mongla**
2004	1764	151
2005	1892	128
2006	1957	153
2007	1945	385
2008	2099	455
2009	2167	446

Source: Compiled by Author with data obtained Chittagong Port and Mongla Port Authorities, 2010

The vessel traffic is relatively high in Chittagong Port region. Table 1 shows that the vessel traffic in two ports areas has been increased during the past five years. There are many types of vessels including oil tankers, military vessels, fishing boats, and cargo vessels.

3.6.2. The Amount of Oil Imports to Bangladesh

The Bangladeshi annual petroleum consumption was about 4.8 million tonnes in 2010 (BP, 2011). Bangladesh imports 90 percent of its oil consumption from Middle East countries every year (See Figure 15). This oil is generally carried by 100,000 DWT oil tankers. However, due to shallow depth such tankers cannot enter into the port of Chittagong. Instead these tankers arrive to anchorage about 40 miles south- west of Chittagong and transfer the cargo into smaller tankers that deliver the oil to Chittagong. These shuttle tankers which are owned by Bangladesh Shipping Company are not in compliance with most of the safety standards. Almost all of these shuttle tankers are single hull tankers built before 1987. Bangladesh has 104 tankers larger than 150 DWT operating in coastal waters. Most of these tankers are old and built before the MARPOL Convention entered into force (Alam, 2004).

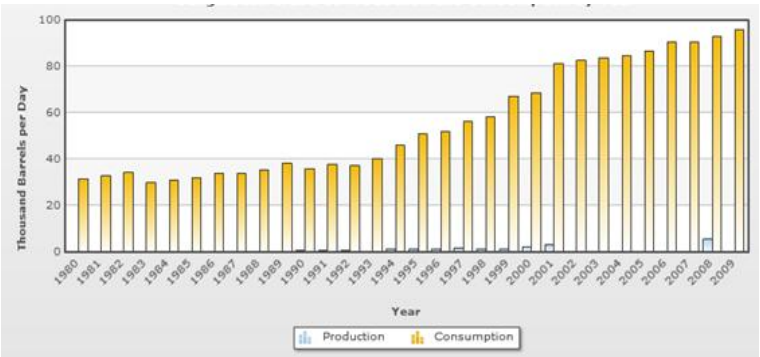

Figure 15: Bangladesh crude oil production and consumption from 1980 to 2009

Source: United States Energy Information Administration, 2010

3.6.3. Past Oil Spills in Bangladeshi Waters

There is no mechanism to report or document oil pollution incidents in Bangladesh waters. As a result of lack of surveillance and reporting mechanisms, only a few oil spills are reported. Table 2 shows the details of oil spill incidents in Bangladeshi waters.

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Table 2: Past oil spill incidents in Bangladesh waters

Year	Incident	Amount of oil spilled
1991	due to cyclone 18 ships sank and spilled oil	unknown
1989	MT Filoti Hull damage	3000 tons
1992	Mt. T.T Energy discharge oil to sea and polluted 64 km of coastal area	Unknown

Source: Compiled by Author with data obtained from national report of Bangladesh, BOBLME, 2010

3.6.4. Potential Consequences of Oil Pollution

The coastal zone of Bangladesh covers slightly over 47 thousand km^2 and 32 percent of the total land area of the country. This area is home to more than 38 million people. About 10 percent of the country is below the 1 meter mean sea level and one third the country is in the tidal extrusion zone (Hossain, 2011). The large numbers of rivers and

low-lying areas have formed the largest deltaic system in the world- Sunderbans. The coastal zone is enriched with marine ecosystems such as mangroves, wetlands, estuaries, lagoons and flood plains.

Mangroves forests represent 50 percent of the country's forest cover. Large and extensive mangrove forests are found in coastal areas of Bangladesh. The mangrove areas are divided into three zones: the Sunderban which is the largest continuous mangrove area in the world with an area of 5 770 km^2, the Chakaria Sunderban in Cox's Bazar with an area of 85 km,^{2} and the planted coastal mangroves. The planted mangrove areas are in Chittagong, Barisal, Patukahali and some offshore islands. The entire planted mangrove area of the country is 1 000 km^2 (Kamal & Khan, 2009). The coastal areas of Bangladesh are composed of the deltas of three major river networks. All the rivers have extensive floods plains. The total area of the floodplains is 54 000 km^2 according to survey of 1985 (Pemetta, 1993).

3.6.5.Socio Economic Importance of Coastal Area

Coastal and marine areas are highly important for the economy of Bangladesh because coastal areas are used for various purposes and the most important coastal economic activity is fishery. The fishery sector contributes to 6.22 percent of the DGP and it also plays an important role as provider of protein. In addition, the sector provides employment opportunities for about 10 percent of the population. There are 1.28 million fishermen, 3.08 million fish farmers and .500 000 fish, shrimp larvae and juvenile collectors. There are four major fishing grounds in Bangladesh covering an area about 6200 km^2 (Hossain, 2004) . Four areas have been declared as fish sanctuaries. Also the coastal zone of Bangladesh is extensively used for aquaculture.

It is clear that the number of ships sailing through the waters is relatively low. However, ships which engage in oil transportation and other activities are substandard and often do

not comply with environmental and safety standards. Furthermore, compared to the Arabian Sea the Bay of Bengal is highly prone to cyclones and other natural disasters which will further accelerate the number of accidental oil spills.

3.7. Pakistan

The entire coast of Pakistan is located in the subtropics. The Pakistani coast on the South- east border at Sir Creek touches the coast of India and the North-western boundary extends into the coast of Iran. The country's coast is facing the Arabian Sea, and it has a coastline of about 990 km with a marine coastal zone of 240 000 km^2 (Khan & Rabbani, 2007). As one of the leading maritime nations in the South Asian region, Pakistan is involved in international trade and most of the import and export products are transported by sea routes. Moreover, coastal areas of the country play an important role in the economy. There is possibility that oil spills will occur in Pakistani waters due to various activities. The details of these risk factors contributing to the risk for oil spills in Pakistani waters are discussed and analyzed in the following section.

3.7.1. Oil Movements in International Shipping Routes

Pakistan is located close to major oil producing regions in the world. Most of the oil produced in the Middle East is transported via the Arabian Sea close to Pakistani waters. More than 70 percent of the world tanker traffic passes through the Arabian Sea. As a consequence, the offshore area and the Exclusive Economic Zone of Pakistan are highly prone to the oil pollution from the tanker traffic from the Arabian Gulf (Rizvi, 1997). Oil pollution can occur in these areas due to, de-ballasting, bilge cleaning and accidental oil spills. The water circulation of the Arabian Sea is clockwise most of the year. As a result, oil slick and tar balls tend to move towards Pakistani waters from the Gulf of Oman (Rizvi, 1997).

3.7.2. Port Operation Activities

There are three commercial ports in Pakistan namely. Karachi Port which is the main and busiest port in the country handling more than 70 percent of the cargo in the country, Muhammad Bin Qasim Port is the second largest port and handles more than 30 percent of the cargo in the country. The number of ships arrived two ports has been increased in the past five years (See Figure 17 and 18). The Gwadar Port is the country's third largest port where operation activities were started in 2008, but so far the port is not in full operation due to construction activities.

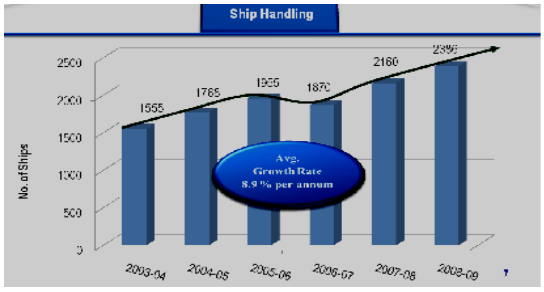

Figure 16: Number of ships handles by port of Karachi in the past five years

Source: Year Book, 2008-2009, Karachi Port Trust

Figure 17: Number of ships handled by Qasim Port in the past five years

Source: Port Qacim Authority

3.7.3. Amount of Oil Import and Oil Pollution Risk

Pakistan consumed approximately 410 thousand barrels of oil per day in 2010 and 80 percent of the consumption of oil was imported from other countries (EIA, 2010c).

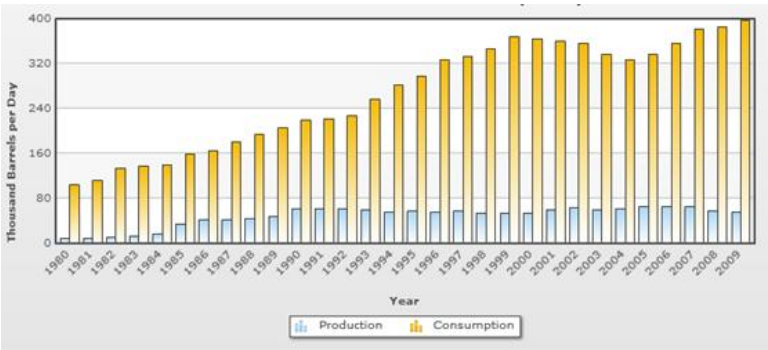

Figure 18: Pakistan crude oil consumption and production from 1980 to 2009

Source: United States Energy Information Administration, 2010

Pakistani oil production from domestic sources leveled off in the past few years (See Figure 19). As a result, importation from other countries has increased significantly during the last decade.

The Karachi Port and Qasim Port handle all oil imported to Pakistan. Karachi Port has an oil peer which is 30 m long and can handle 150 000 DWT vessels (KPT, 2010) The Qasim Port oil terminal is operational since 1995. It is capable of handling 9 million tonnes of oil per year. The facility mainly consists of a jetty and it is capable of handling up to 75000 DWT vessels, product pipelines, loading arms and a 4 km long trestle that connects the jetty with the shore (PQA, 2010).

3.7.4. Offshore Oil Exploration and Production

There is no offshore oil production facility in the country at present. However, the government has signed agreements with private oil companies involving 17 offshore licenses. The oil exploration activities have already begun by a few companies (MPNR, 2009).

3.7.5. Past Oil Spill Incident in Pakistan Waters

There is not proper information related to past oil spills. However, two spills have been relatively well reported in the past decade. The Yashika 6 spilled furnace in an area of

west Karachi. Nevertheless, no oil reached to shoreline. The Tasman Spirit grounded at the entrance of Karachi Port in 2003 spilling of 30 000 tones of Iranian crude oil. This spill was probably the largest in the region until now. The cleanup operations of the oil from the Tasman Spirit lasted for several months (ITOPF, 2010a).

3.7.6. Consequences of Oil Pollution in Pakistan Waters

The coast line of Pakistan spans across the provinces of Singh and Baluchistan, 241 and 660 km in length respectively. The Indus Delta in the Singhi province represents the most prominent geomorphologic features of the coast of Pakistan (IUCN, 2005). The extent of the mangrove area in the delta is approximately 2 500 km,^{2} which makes it the sixth largest mangrove area in the world. However, Baluchistan has only a few patches of mangroves (Ahmad, 1997). Mangroves areas serve as a nursery for fish and shellfishes and provide other products to the local communities.

The fishery is the most important economic activity in coastal and marine area. Pakistan has rich fishing grounds along the coast; therefore, the fishery sector presently contributes about one percent of the DGP and one percent of the employment opportunities (Hayat, 1999). During earlier oil spills the fishing industry suffered serious losses (Beg, 2004). Other important economic sectors in the coastal areas are salt production and cooling water for various industries, including nuclear power plants. In general oil spills in Pakistan waters can have serious consequences in the coastal environment and economic activities.

3.8. Maldives

The Maldives is an archipelago with 26 natural atolls consisting of 1190 small low-lying coral islands. The total exclusive economic zone is 959,000 km^2 (Ali, 2010), but the land

area accounts only about one percent of the total area of the country. As a result, the country is almost totally depending on the marine environment.

3.8.1. Port Operation Activities

Male is the only major port in the Maldives and it is used for export and import activities. The total number of ships arrived to Male Port was 307 and 354 in 2008 and 2009 respectively (MPL, 2010). Male Port is very important for the economy of the country.

3.8.2. Oil Import to Maldives

There is no oil refinery in the Maldives. Therefore only refined oil products are brought into the country. Maldives National Oil Company signed a Crude Oil Refining and Processing Agreement with Ceylon Petroleum Corporation of Sri Lanka in 2003. Under this agreement, the Maldives obtains crude oil directly from crude oil producing countries for processing in the refinery located in Sri Lanka. The refined and processed products will be taken back for consumption in the Maldives (MNOC, 2010). Since 2000, oil consumption of Maldives has increased significantly (See Figure 20).

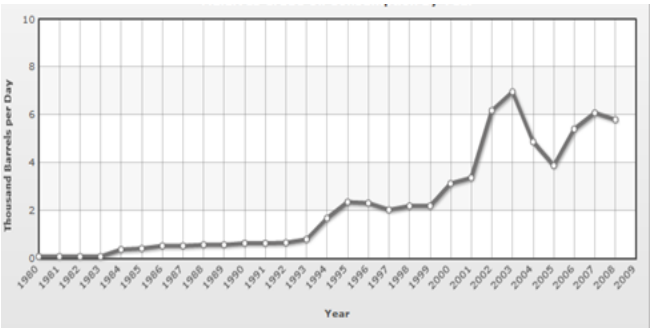

Figure 19: The Maldives crude oil consumption from year 1980 to 2009

Source: United States Energy Information Administration, 2010

3.8.3. Past Oil Spill Incidents in Maldives Waters

There has been only one medium size oil spill reported so far in Male harbour. A Greek vessel Elka grounded at the mouth of the harbor in Male in 1982. The quantity of oil was however very limited and the shipping company paid for the cleaning operations (UNEP, 1986). Other than this spill, no significant oil pollution incidents have been reported in the Maldives for the past 15 years (BOBLME, 2010). The daily operation of vessels is causing some amount of pollution in Male harbour. However, there is no reporting mechanism for oil spills in the country or there has not been any studies carried out on this topic. As mentioned before the number of vessel movements in Maldivian waters is low. Therefore, the likelihood of oil pollution incidents is relatively low.

3.8.4. Potential Consequences due to Oil Pollution

A range of coastal ecosystems including coral reefs, sea grass beds, lagoons, beaches, and small areas of mangrove are found in the Maldives which has the largest reef system of any country in the Indian Ocean. The total reef area is over 21 000 km^2. The most important ecosystems in the Maldives are the coral reefs. The Maldives has over 800 small vegetated coral islands. The coral reefs in the Maldives are very rich in biodiversity, including more than 250 coral species, 1200 reef fish species, 5000 species of shells and over 1000 species of crustaceans (Ali, 2010).

The economy of the Maldives depends entirely on the coastal and marine ecosystems as the asset base of the national economy. The coast and associated coastal reefs are the lifeline of the nation (BOBLME, 2010).The direct value of the coastal ecosystem is huge. The Maldives economy and livelihood of the people are mainly dependent on coastal ecosystem.

The main income sources of the Maldives are tourism and fisheries. Tourism, the largest contributor to GDP, is based wholly on the health and attractiveness of Maldives's coastal features. Tourism and fisheries are the main income sources of the country which contributed to the national economy with 7% and 27% GDP respectively (BOBLEM, 2010).Due to the tiny area of islands, the total land area can be considered as a coastal area. The consequences of an oil spill in Maldives waters are very high due to all the above factors.

3.9. Sri Lanka

The country is located in the Indian Ocean south-east of India with a land area of approximately 65 000 km^2 and a coastline of 1 620 km. The Exclusive Economic Zone of the country is about 517 000 km^2. The country is located at strategic point in terms of shipping.

3.9.1. Vessels Movements on International Shipping Route

The international shipping routes which are used to transport oil from the Middle East to Far East country routes are very close to the Sri Lankan coast at Dondra head. Therefore, there are significant risks for accidents. A traffic separation scheme exists which probably reduces the accident risks. The coastal influence is very strong off the eastern coast of Sri Lanka where currents are often irregular and unpredictable. Occasional groundings of ships have been reported in the area (ITOPF, 2005).

3.9.2. Port Operation Activities

Colombo Port, which is one of the three major ports, is the busiest and commonly used as a transshipment port by regional countries. The Colombo port is the busiest port in the South Asian region. The table 3 shows that the number of ships arrived to port in the past five years. Hence, the number of ships arriving to the port is high and due to congestion in port and anchorage area, there is high likelihood to an accident to occur.

Table 3: Number of ships arrived to Sri Lankan ports

Year	No. of ships arrived
2005	3929
2006	4228
2007	4326
2008	4424
2009	4114

Source: The Central Bank Report of Sri Lanka 2009

3.9.3. Oil Import and Loading and Unloading

Most of the imported oil originated from the Middle East countries. Ceylon Petroleum Corporation is using land oil that comes from an under-sea pipeline from an off shore terminal. The terminal is operated through-out the year, even during the monsoon period and approximately two tankers carrying 120,000 tons of crude oil are transferred to the tanks ashore every month (MEPA 2009a). The table 4 shows the amount of oil was imported during the past three years.

Table 4: Details of crude oil import to the Sri Lanka

Item	2005	2006	2007	2008
Crude oil (MT 000)	2008	2151	1968	1853
Refined product	1823	1810	2314	2386

Source: Central Bank Report Sri Lanka, 2009

3.9.3. Offshore Oil Exploration and Other Services

Offshore oil spills and other maritime services pose oil pollution risks. Offshore oil exploration activities in Sri Lankan waters were recently commenced and the drilling of test wells is presently in progress. The oil exploration is presently going on offshore of the Gulf of Mannar and this area is very close to the highly sensitive coastal area. In addition, a number of small tankers provide bunker services to ships arriving to Sri

Lankan ports as well as to ships sailing though the international route. Obviously this poses a threat of accidental oil pollution.

3.9.4. Past Oil Spills in Sri Lankan Waters

Most of the reported oil spills have been caused by cargo ships, not from oil tankers. A number of oil spills have been reported from the west and south and east coast and part of the sea in country. More than eight spills incidents have been reported from Sri Lanka since 1997(MEPA, 2009b).

3.9.5. Consequences due to Oil Spills

The coast line of Sri Lanka consists of a wide range of ecosystems. The ecosystem such as mangrove, coral reefs and lagoons are highly productive and provide a number of benefits to the country. There are about 45 estuaries and 40 lagoons totaling about 420 km^2. The total extent of mangrove coverage is between 60 and 100 km^2. Coral reefs are found along approximately 50 coastlines (Lowry & Wicremeratne, 1988). These important ecosystems are scatted around the coastline of the country (See Figure 21).

Figure 20: Ecologically sensitive coastal areas in Sri Lanka

Source: Ministry of Environment Sri Lanka, 2006

The coastal population is highly dependent on the coastal resources and more than 2 million people directly depend on fishery for their livelihood. In addition, more than 80 percent of the hotels are located in the coastal zone. An oil pollution incident can have a serious impact on the coastal economy. For example, the estimated cost of the Amanat Shah Oil spill (less than 100 tonnes) incident in 2006 was over 5 million USD (MPPA, 2007).

3.10. Other Common Factors Affecting Oil Spill Risk in the Region

3.10.1. Geographical Factors Affecting Oil Spills

Other than the vessel traffic, there are other factors which significantly influence risks of oil pollution incidents. The most important factor is the prevailing weather condition at sea. The Indian Ocean is subject to various weather changes and weather changes develop harsh conditions. Especially the monsoon season combined with the tropical cyclone season create extreme weather conditions in Indian waters. During most of the year the sea conditions are rather good, but as cyclones occasionally occur. Moreover, impacts of cyclones are relatively high in the coastal region (SAARC, 2007). Table 5 shows that the number of severe cyclones in the Bay of Bengal has sharply increased during the past two decades, while the number of cyclones in the Arabian Sea has increased at a relatively lower rate than that of the North Indian Ocean. It can also be observed that even normal monsoons are rather windy.

Table 5: Change in Number and percentage of cyclone/ hurricane in different regions

Basin	1975-1989	1990-2004
	Number	Number
East pacific ocean	36	49
West Pacific ocean	85	118
North Atlantic	16	25
South West pacific	10	22
North Indian	1	7
South Indian	23	50

Source: South Asian Disaster Report 2007

As mentioned above strong winds affect the safety of ships sailing thought the region and can increase the likelihood of collisions, groundings and structural failures of ships. The combination of harsh weather conditions and high traffic density will increase collisions and groundings. However the likelihood of grounding is not so high because offshore water depth in Indian Ocean is high. A combination of these two factors significantly increases the risk of collisions and oil pollution.

Cyclones in the coastal areas of Bangladesh are frequent and often followed by destructive wave surges and extreme high tides. The frequency of cyclone occurrence has been increasing since 1990 (Islam & Peterson, 2003). Around 12 to 13 tropical storms are reported in each year and half of them attain cyclonic strength around three or four in the Bay of Bengal and they affect Bangladesh (ESCAP, 1988). Unlike other countries in the South Asian region, Bangladeshi marine and coastal zones are highly prone to natural disasters such as cyclones and tornadoes. These events have become frequent due to climate change impacts (MEFB, 2006).

3.10.2. Ship Breaking Industry

Presently the global centre of the ship breaking industry is located in the South Asia (Sarraf et al., 2010). India, Pakistan and Bangladesh are the major ship breakers in the

world and every year 600-700 ships end up in ship breaking yards in these three countries. (Hossain & Islam, 2004). It is noteworthy that most of these vessels on their last voyages hardly comply with regulations and many such vessels in the South Asian region increase risks of collision with other vessels and therefore increase the oil pollution risk (Sharma, 2009).

3.10.3. Implementation of Pollution Prevention Measures

Proper implementation of preventive measures helps to reduce accidents and accidental oil spills. Although during the past two decades the world's sea borne trade has increased significantly, the amount oil spilt into the sea has decreased. This reduction is basically due to preventive measures taken by the maritime community. During the last three decades, introduction of better and safer routines on board in combination with safer and better equipped ships and improved enforcement have contributed to this positive development. More effective legal instruments, targeted policy directives as well as more effective monitoring mechanisms have also contributed. However, implementation depends on individual states. National maritime administrations have the responsibility to inspect ships flying there flag as well as maintaining control of vessels visiting ports under their jurisdiction. Flag state survey and inspection is very important to improve safety conditions of their flag ships. According to Indian Ocean MOU data, the flag state and port state control activities in the South Asian region is very poor. As a result, most of the ships in the region do not comply with safety and pollution prevention measures. Moreover, the fact that a high portion of substandard ships sail the Indian Ocean, leads to increasing threats of oil pollution (Karim, 2009).

3.11. Oil spill risk profile of south Asian region countries

The risk of oil pollution mainly depends on the likelihood of oil pollution incidents and the consequences of the oil pollution incidents. After analyzing all contributory factors, the risk oil spill risk profile of the countries shows in Table 6. However it should be

noted that this is only a comparative risk to make a comparison between countries in the region as per the relative risk of each country.

Table 6: Oil pollution risk in south Asian regional countries

Item	India	Bangladesh	Maldives	Pakistan	Sri Lanka
Likelihood	High	low	low	medium	medium
Consequences	high	very high	very high	high	high
risk	high	medium	medium	medium	medium

Source: Compiled by author from the analysis of information

Accordingly, other than India, other regional countries have a medium risk of oil pollution. In addition, the South Asian region is classified as a medium risk region of oil pollution and high priority area by ITOPF (Moller, Molloy, & Thomas, 2003).

Chapter 4

Present Status of Preparedness and Oil Spill Combat Capabilities of the South Asian Countries

4.1. Introduction

The South Asian region is subject to a medium risk of oil pollution incidents when all countries are considered as a whole. The countries in South Asia have already taken a number of measures to minimize the oil spill risk. This chapter discusses the present status of oil spill preparedness and combat capabilities of each country and legal regimes adopted to strengthen oil spill combat capabilities and oil spill liability and compensation.

4.2. Oil spill Preparedness and Response in India

India runs a substantially higher risk for oil pollution than the other countries in the region. In order to minimize oil pollution impacts, India has taken several measures which will be reviewed.

4.2.1. Legislative and Institutional Arrangement to Deal with Oil Spill Incidents

As all other countries, India has established a maritime administration in order to regulate the shipping sector. The principal agency dealing with shipping, Director General Shipping (DG Shipping) was established under the Merchant Shipping Act, 1958. The DG Shipping is responsible for implementation of regulations regarding safety and environmental issues and regulatory measures related to shipping. The

Merchant Shipping Act has been amended 13 times since 1958 and accommodated most of the provisions relevant to international conventions.

The DG Shipping is responsible for various matters related to shipping such as matters affecting to navigation and administration of the merchant shipping laws, measures to ensure safety of life and ships at sea, the consideration of international conventions and regulations related to marine matters. According to these responsibilities, all administrative matters related to marine pollution from ships are handled by DG shipping. India is party to the most of the IMO Conventions on safety of ships, marine pollution and the compensation related Conventions. Most of the above Conventions have been implemented through the Merchant Shipping Act of India. The Merchant Shipping Act Part XB, XC and XIA are more relevant to oil spill response while part XB deals with Civil Liability for oil pollution damage. Part XB was incorporated by the Act of 1983. Part XC deals with the Fund Convention which has partly has been inserted by the Act 63 of 2002 (Kumar, 2007).

The Indian Coast Guard (ICG) was established under the Indian Coast Guard Act of 1978. As spelt out in this Act, the ICG is responsible for taking such measures as are necessary to preserve and protect the marine environment and to prevent and control pollution. In addition, considering operational capability ICG, all aspects concerning marine pollution and control was delegated to the ICG by DG Shipping under the special Gazette notification in 1986 (OSMPRMC, 2003).

Furthermore, the Central Pollution Control Board has certain powers to prevent pollution in Indian waters under the Environment Protection Act 1986. Regulations have been formulated to control marine pollution from industrial activities including offshore oil exploration.

4.2.2. National Oil Spill Disaster Contingency Plan (NOS-DCP)

First NOS-DCP was drafted by ICG in 1988 as per delegated power by the Merchant shipping Act (ICG, 2006b). The ICG has nominated as a lead agency for overall coordination, while the plan identifies the requirements of cooperation among various agencies and delineation of their responsibilities. The NOS-DCP was approved in 1993 by the Government of India and the Director General of ICG was designated as the Central Coordinating Authority to implement the plan (OSMPRMC, 2003). Since then the plan has been amended several times when this was required.

The contingency plan was developed based on a tiered response that classified oil spills into three categories. Tier-1 is a small spill within the capabilities of an individual facility or harbor authority; 700 tonnes is the upper limit of Tier-1. Tier-2 is consider preparedness and response to oil spills of 700-10 000 tonnes. To respond to this type of spill support from other agencies is required. Tier-3 is major oil spills of more than 10 000 tonnes requiring the mobilization of regional and international resources. However, to compare to other countries Tier-1, the Indian Tier-1 is quite different. The size of Tier-1 oil spill is larger than that of the other countries.

4.2.3. Oil Spill Response Organization

The Ministry of Home Affairs is the coordinating agency for crisis management in case of oil spill disasters; therefore, under the chairmanship of the Secretary of Home Affairs a Crisis Management Team (CMT) was established. The CMT includes high level officers from all relevant stakeholder agencies. The CMT should become functional when a crisis situation arises. The Director General of ICG is the Central Coordination Authority when the NOS-DCP was implemented. Depending on the location of the oil spill On-Scene Commander will we appointed. The On-Scene Commander will be the Regional Commander of the ICG. Sea response will be initiated under the leader ship of the On-Scene Commander.

4.3.4. Regional Oil Spill Disaster Contingency Plans (ROSDCP) and Response Centers

The entire marine area around the Indian coast including islands is divided into three regions; West, East and Andaman and Nicobar and three Response Centers were established namely, Mumbai, Chennai and Port Blair (ICG, 2006b). There are three ROSDCPs to respond to oil spills in each region. ROSDCP need to be implemented if tier-2 oil spills occurs. The three Regional Commanders of ICG are responsible for implementation of ROSDCP. The ICG is mainly responsible for at sea response while the Pollution Control Board is responsible for land response. In addition to that ICG regional centers have also taken action to promote district level contingency plans (ICG, 2006).

4.3.5. Salient Features of Oil Spill Contingency Management and Response

The India oil spill response is arranged according to tiered responses. India has well developed NOSDCP with considerable amount oil spill response equipment and trained personnel. Presently, India has the capability to respond oil spill up to 10 000 tonnes. The National Plan integrated with regional Plans and local plans were also developed for facility levels. The NOSDCP and regional plans regularly updated and exercised. Three Response Centers with equipment stockpiles to combat spills are established to cover the large coastline on regional basis. Also, training and exercises and drills are conducted regularly in order to increase efficiency of the oil spill contingency plan.

4.3.6. Weaknesses of Oil Spill Contingency Management and Response

The Oil spill contingency plan has a properly explained strategy for oil spill response; however, there are no details of response structure and operational details. It can be clearly seen that the contingency plan is mainly focused on the response at sea. The responsibility of response of oil spills onshore has been given to the Central Pollution Control Board and local authorities. A recent oil spill incident offshore Mumbai revealed

that it was not possible to contain and recover all the spilled oil in the offshore area. Therefore, strengthening of shoreline response capability is necessary. Further, the coordination between shoreline response and sea response is required during oil spill response. A coordination mechanism for sea response and shoreline response is not included in the plan. Another important aspect of spills is termination of oil spill response which is not included in the plan.

Moreover, several international agencies have developed guidelines for oil spill contingency plans and developed the content of oil spill contingency plans. However, the NOS-DCP has some deviations from these international guidelines. The group of expert also identified same as a weakness of NOS-DCP in 2003 (OSMPRMC, 2003).

4.4. Oil Spill Preparedness and Response in Bangladesh

Fortunately, Bangladesh so far has not experienced any large oil spill disasters. There were several small size oil spills in past decades. Considering importance of this the Bangladeshi government has taken several measures to introduce oil pollution control and response mechanisms in Bangladesh waters.

4.4.1. Legislative and Institutional Arrangement to Deal with Oil Spills

There is no comprehensive law directly dealing with vessel source marine pollution in Bangladesh. However, there are legal provisions under various legislations to a deal with marine pollution which cover marine pollution to some extent. The Environment Conservation Act, 1995 is the umbrella legislation for environment protection. The provisions of this act can be used to protect marine environment to some extent. The Environment Conservation Act defines pollution in a broad manner. Therefore, the wide definition can accommodate all types of environmental pollution or discharges from vessels. In addition, if any accidental discharge incident occurs, a responsible person has to take measures to control or mitigate the pollution as per Act. The pollution incident

should also be notified to the Director General, Department of Environment (Karim, 2009).

The Merchant Shipping Ordinance (MSO), 1983 is the umbrella law for regulating shipping in Bangladesh. The Merchant Shipping Ordinance established the Department of Shipping and other relevant government bodies pertinent to shipping. The Department of Shipping is responsible for regulating shipping and implementing IMO Conventions. The Merchant Shipping Ordinance deals with a ship registration surveying and safety related matters. However, there is no provision to deal with marine pollution.

Another important organization related to marine pollution response is Bangladesh Coast Guard (BCG). It was established under the Coast Guard Act 1994. The BCG is empowered to take measures against marine pollution in the exclusive economic zone of Bangladeshi waters. However, the Coast Guard has no powers to enforce any international conventions.

Further, the port related law has given some powers to prevent marine pollution within the port area. Two commercial ports in Bangladesh have been established under the separate ordinances. The Chittagong Port Authority Ordinance 1976 has provisions to deal with marine pollution within the port. According to Ordinance causing pollution of the port area shall be punishable by fines. Similar provisions are included in the Mongla Port Authority Ordinance 1976 (Karim, 2009).

It is noteworthy that Bangladesh is not party to any liability and compensation related international convention. Also, there is no national law to deal with the aforementioned matter. Therefore, if any spill occurs in Bangladesh waters, the cost of damages and cleanup cannot be obtained.

Considering weaknesses of legislation to control marine pollution from ships and other sources, the Department of Shipping drafted the Marine Environment Conservation Act

in 2004. The drafted Act aimed at conserving and preventing marine pollutiin in Bangladesh. According to sections 14 and 15 of the draft Act, ships shall fitted with the necessary equipment to prevent pollution and deal with pollution incident. Any ship which is not complying with these provisons shall be detained. Also, part iii of the Act comprises provisions relevant to civil liability for maritime caualties (Karim, 2009).

Moreover, the section 35 of the Act has provided provisions regarding oil spill contingency plan requirement at national and local levels. The Act has given authority to the head of the contingency planning to aquire any servies such as persons, materials, and equipment required for the oil spill response. In addtion, the draft Act provides provisions to give effect to seven International Conventions. Bagaldesh is not party to the "OPRC Convention" yet, but relevant provisions have already been incoporated to the Act. Therefore, Bangaldesh will be able to ratfy this convention in the future

4.4.2. National Oil Spill Contingency Plan

The National Oil Spill Contingency Plan of Bangladesh was formulated in 2002 under the oil spill impact and response management programme funded by the Asian Development Bank. However, so far the plan has not been approved by the government. The Department of Shipping is the responsible agency for implementation of the plan, but may delegate these powers to BCG in the event of an oil spill (ITOPF, 2010b). The scope of the plan is to delineate responsibilities for the operational responsibilities to marine pollution incidents. The plan provides the framework for coordination of an integrated response by government agencies to protect the marine environment from spillage of oil. Four committees have been established under the plan. The National Marine Pollution Management Council (NMPMC) comprises senior members from relevant Ministries. The committee is responsible for policy formulation and coordination of marine pollution contingency planning and combat at national and zonal levels (ADB, 2002).

The plan clearly laid down procedures for notification and alerting. After notification of an oil spill, On-Scene Commander should be nominated as per direction of the committees. The On-Scene commander should activate the plan. A pollution response activity at sea is coordinated by BCG while land response activities are coordinated by the Divisional Environmental Authority. Shoreline cleanup responsibilities outside port limits have been given to local authorities.

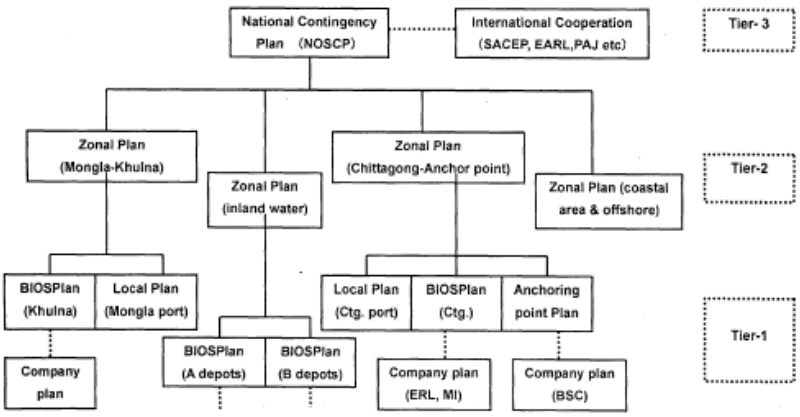

Figure 21: Relationship between tiered response and each oil spill contingency plan in Bangladesh

Source: Oil spill impact and management programme, 2002

Figure 22 shows that Bangladeshi oil spill response system uses a tier concept and Tier-1 is defined as a small local minor spill within the facility or port area; Tier-2 is a medium spill that requires other agencies support. When Tier-2 spill occurs the zonal plan should be implemented. Tier-3 is a large oil spill and all agencies support is required and the national oil spill contingency plan should be implemented (ADB, 2002).

4.4.3. Salient Feature of Oil Spill Contingency Plan and Weakness

The plan has described all agencies responsibilities and established response organization for oil spill response involving all the related stakeholder agencies. However, so far Department of Shipping failed to obtain government approval for the plan. Therefore, it is difficult to implement the plan in any event of an oil spill. The contingency plan has provided details of response strategies as well as sensitive areas. Responsibilities given in the plan to stakeholder agencies are difficult to carry out due to non availability of sufficient amount of equipment and trained manpower.

4.5. Oil Spill Preparedness and Response in Pakistan

As Pakistan experienced a major oil pollution incident in 2003, several measures have been taken to minimize and control marine pollution threats. This section will discuss regulatory and oil spill preparedness measures and weakness in the present system.

4.5.1. Legislative and Institutional Arrangement to Deal with Oil Spill Incidents

There is no comprehensive piece of legislation dealing with marine pollution, but there are several agencies with some regulatory powers to prevent and control marine environment pollution. The Pakistan Environmental Protection Ordinance (PEPO) 1983 was the first legislation that focused on environmental protection (UNEP, 1986). The PEPO 1983 was replaced by the Pakistan Environment Protection Act (PEPA) 1997. PEPA is the most important legislation related to environment protection so far. However, it has not covered marine pollution in a comprehensive manner.

There was no policy or legislation which directly addressed oil pollution and oil spill management before 2003, after the catastrophic oil spill incident Tasman Spirit in Karachi Port, the National Environmental Policy 2005 was introduced. This policy put forward the following measures to address oil pollution due to accidental spills, formulation of a national oil spill contingency plan, adoption of mitigatory measures

impact caused due to oil pollution, establishment of a Marine Pollution Control Commission and also emphasis on the implementation of international conventions and related matters (MOEP, 2005).

Moreover, Pakistan Merchant Shipping Ordinance, 2001 is the main legislation related to ship based pollution. As per Ordinance, Pakistan Maritime Administration has established and given authority to flag state administrations as well as port state control. This agency is responsible for executing international conventions associated to vessel safety, and marine environmental protection from ships.

The Maritime Security Agency Act (1994) is one of the pertinent legislation to marine pollution prevention. The Pakistan Maritime Security Agency (PMSA) is responsible for assisting and coordinating, prevention and control of the effects of marine disasters including pollution and implementation of international agreements and conventions in Pakistani waters (Mian & Benett, 2009).

Further, the Port Act of Pakistan has included provisions related to prohibition of discharge of ballast or rubbish into port waters to ensure safety of ships. The prevention and control of pollution inside the port limits has been given to the Port Authority under the amended Karachi Port Ordinance 1994. Also discharge of oil or any other pollutant into the port is prohibited under the ordinance.

When analyzing the related Acts and Ordinances, it is clear that there is no comprehensive legislation to deal with oil spills and oil pollution prevention. None of the agencies has legal provisions to deal with marine pollution incidents and several Acts were given different authorities to different agencies. For instance, Pakistan Merchant Shipping Ordinance has given authority to the Director General of Ports and Shipping, while Maritime Security Agency Act 1994 authorizes the Director General of Maritime Security Agency (Mian & Benett, 2009). This situation creates conflicts

among agencies when an oil pollution incident occurs. This was evident when Tasman Spirit oil spill occurred in Karachi in 2003.

Moreover, Pakistan is party to the MARPOL Convention and OPRC Convention even before the Tasman Spirit oil spill occurred in Pakistan in 2003. The MARPOL Convention has been given effect through Merchant Shipping Ordinance in 2001. However, there was no approved national Oil Spill Contingency Plan, when the Tasman Spirit spill occurred. Even after eight years of major oil spill, provisions in the OPRC Convention have been not incorporated to the National legislations. (Mian & Benett, 2009).

The Tasman Spirit oil spill attacked public and political attention on oil pollution incidents and this paved the way to take several actions. As a result of impact of the Tasman Spirit oil spill incident Pakistan became party to the Civil Liability Convention and included oil spill management in the environmental policy of 2005 (Mian & Benett, 2009). However, even after seven years of high profile oil spills, Pakistan has not yet taken action to become party to the Fund Convention.

4.5.2. National Marine Disaster Contingency Plan (NMDCP)

The catastrophic Tasman Spirit oil spill in Karachi resulted in some changes in oil spill preparedness activities in Pakistan. Subsequently PMSA drafted a National Oil Spill Contingency Plan. In the meantime there was a requirement of a comprehensive NMDCP to cater for all types of marine disasters. As a result, a comprehensive NMDCP was proposed which included pollution from oil, search and rescue and salvage operations. The National Oil Spill Contingency Plan was incorporated as part of this comprehensive plan. The NMDCP was approved by the government in 2007 (PMSA, 2009).

The Pakistan Maritime Disaster Management Board is responsible for taking policy decisions, while the Maritime Disaster Response Committee (MDRC) is responsible for execution of the plan. The Disaster Response Center was established at the head quarters of PMSA. In the Event of any marine disaster the MDRC should assemble at the Disaster Response Center and take measures to implement the plan. The overall activities are coordinated by PMSA. The PMSA has been nominated as a designated body for operational activation of plan and overall coordination of oil spill response activities. Although shoreline cleanup responsibilities have been given to the respective provincial governments, in the event of an oil spill, provincial governments need assistance from PMSA (ITOPF, 2010a).

4.5.3. Salient Feature of Oil Spill Contingency Plan and Weaknesses

The PMSA is the designated agency for formulation and update of the plan. Also, the plan uses all agencies' support in the event of oil spills and includes all private agencies' details related to the plan. The plan defines the tired concept and accordingly responsibility of response to small oil spill has been given to potential polluters. However, responsibilities given in the plan for various institutions are not realistic, because most of the agencies do not have sufficient capacity to carry out delegated tasks by the plan.

4.6. Oil spill Preparedness and Response in Sri Lanka

Sri Lanka has taken several measures to prevent and control oil pollution. The details of oil pollution control mechanism are described below.

4.6.1. Legislative and Institutional Arrangement to Deal with Oil Spill Incidents

The marine pollution from ship based sources is manly covered by the Marine Pollution Prevention (MPP) Act, 1981. The objective of the MPP Act is to prevent, reduce and control marine pollution and give effect to international conventions related to marine

pollution. However, there was no legal provisions relevant to oil spill contingency planning requirement in the MPP Act. The Marine Pollution Prevention Authority (MPPA) was established under the same Act in order to implement the Act. The MPP Act underwent major revision in 2008 and the Marine Pollution Prevention Act no 35 of 2008 came into force in 2009. The name of the MPPA has changed to the Marine Environment Protection Authority (MEPA) which is responsible for formulating and implementing National Oil spill Contingency Plan.

Further, the section 38 of the mentioned that it is a duty to report oil or other pollutant discharged into the Sri lanka waters. Accordingly, polluter should report incident with out delay to the MEPA. In addtion, MEPA has power to direct all persons incharge of ports, habours, terminlas, and repair yards to submit oil spill contignecy plans as per section 39 of the MPP Act. All these provisions are in the OPRC Convention. Although Sri Lanka is not yet party to the OPRC Convention, the legal provisions relevant to the OPRC Convention were already incoporated to the MPP Act. Moreover, Part VIII of the act contains provisions for prevention of pollution caused by discharge or escaped of oil, harmful substance or other pollutant into the territorial waters of Sri Lanka or any other Maritime zone. According to this section discharge or escaped oil or other pollutants into the sea from a ship, or other sources shall be guilty of an offence. However, in order to implement these provisions, it is necessary to prepare detailed regulations.

4.6.3. National Oil Spill Contingency Plan (NOSCP)

The first NOSCP was prepared by the MPPA in 1995 and was revised in 1998. The NOSCP received approval of the Cabinet of Ministers in July 2000. After that the plan was amended comprehensively and obtained approval of the government in 2004 (MEPA, 2009b).

The MEPA is responsible as a lead agency for the implementation of the plan. The tier concept was incorporated to the plan. Accordingly, Tier-1 defined as an oil spill less

than 50 tonnes, Tier-2 oil spill 50 to 100 tonnes and Tier-3 oil spill more than 100. All oil handling agencies and ports should formulate oil spill contingency plans for response tier I oil spills. When more than 50 tonnes oil spills occur, the NOSCP should be implemented.

4.6.4. Response Organization of NOSCP

The director of NOSCOP is responsible for taking initiatives to implement the contingency plan. The procedure is laid down in the plan to declare environmental emergency through the National Disaster Management Center in the event of a major oil spill (See Figure 23).

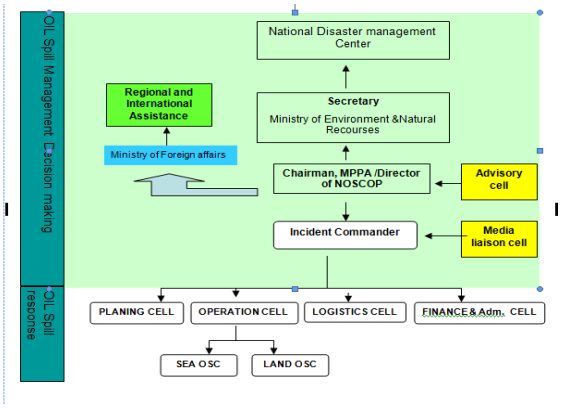

Figure 22: Response organization of NOSCP of Sri Lanka

Source: National Oil Spill Contingency Plan Sri Lanka, 2009

4.6.5. Salient Feature of Oil Spill Contingency Plan and Weaknesses

Sri Lanka NOSCP has used the Incident Command System (ICM) in oil spill contingency management. According to ICM a response organization was established and responsibilities were given to each team. Further Environment sensitivity maps were developed around the country with environmental sensitivity index. However, non availability of oil spill response equipment and trained human resources to implement the contingency plan is the main issue.

4.7. Oil spill Preparedness and Response in the Maldives

The Maldives is an archipelagic island situated very close to main international shipping routes and is therefore prone to medium risk of oil pollution. The Maldives has taken some measures to control oil pollution, which will be reviewed below.

4.7.1. Legislative and Institutional Arrangement to Deal with Oil Spill Incidents

There are few existing policies and legislation on marine pollution and pollution control in the Maldives (BOBLME, 2010). The existing mechanism for pollution control is not adequate. There are a few agencies that vested powers to prevent and control marine pollution. The Environment Protection Agency (EPA) of the Maldives is the main regulatory authority, which has the mandate to protect the environment from pollution. However, EPA mainly focuses on land based pollution not on ship based pollution (BOBLME, 2010).

The Transport Authority under the Ministry of Transport and Communication is responsible for dealing with sea transportation and maritime safety. The Transport Authority has implemented various regulations and ratified several international conventions to protect the marine environment. The Maldives has ratified several international conventions related to marine pollution prevention from ships, although incorporation of legal provisions in international conventions into the national legislation is limited. So far, there is no comprehensive legislation to deal with marine pollution from ships.

In addition, the Maldives Coast Guard has the mandate for the oil pollution response in the country. Coast Guard has in house oil spill contingency plan and a limited amount of oil spill combat equipment. It is only sufficient for responding to small oil spills. There is no comprehensive plan to respond oil spill with incorporation of other agencies (ITOPF, 2010c).

The major port under the control of the Maldives Ports Limited and established under the Presidential Decree in 1986. Ports Limited is responsible for prevention of pollution within the harbour area. The port carries out vessel inspection inside port waters to minimize pollution. If any vessel is found not in compliance with environmental standards, it will not be given permission to enter to the port. However, the Port does not have equipment or oil spill contingency plan to respond oil spills. Port authority notifies to Coast Guard in the event of an oil spill and accordingly the Coast Guard has to respond. The oil pollution legislation and policies in the Maldives to control and prevent marine pollution is feeble and limited (Ali, 2010).

4.7.2. Oil Spill Contingency Plan and Response Mechanism

There is no operational National Oil Spill Contingency Plan the Maldives at present. The formulation of a National Oil Spill Contingency Plan is currently going on under a special project and it will be finalized in 2013. The Coast Guard has been identified as a designated agency for pollution response. The Coast Guard has their own oil pollution contingency plan and which has been formulated as per US and Indian national plans. However, the Coast Guard does not have sufficient combat capability to respond to major oil spills due to limited oil spill combat equipment (BOBLME, 2010).

Chapter 5

Comparative Assessment of Oil Spill Preparedeness Combat Capabilities in the South Asian Countries

5.1.Background

Countries in the South Asian region have adopted various prepardness measures to respond to problems arising out of oil spills and resultant pollution in their waters. As illustrated in earlier chapters, there are differences in terms of the levels of oil pollution preparedness within these five countires. Some countries have adopted efficient systems to manage the risks oil pollution, others have not taken adequate measures. It is necessary to comparatively assess all these countries' abilities to prepare and respond to oil spills, which will give a better picture regarding their strengths and weaknesses with regard to the available combat-ready systems. Accordingly, countries can improve their oil spill preparedness systems. In addition, it is true that when a major oil spills occurs, a country often seeks assistance from its neighbours to respond to the emergency.The results of the comparative assessment can be used to improve regional oil spill contingency planning.

However so far there seems to be no internationally accepted criteria for assessing oil spill combat capabilities of different countries. The International Oil Spill Conference Guidelines was introduced 28 elements under the six broad categories for oil spill response planning and assessment (IOSC, 2008). The IMO introduced five main elements to the assessment of the level of oil pollution preparedness (IMO, 2010). After studying other criteria, considering the data and other available resources, the author selected three main elements to assess the countries' oil pollution preparedness levels to

deal with oil pollution incidents. These were contingency planning practices,response equipment and supporting resources, legislation and regulations

In order to measure each element, a set of indicators was first identified. As indicators the author used the variables or standards and according to the levels of adaptation of variables, scores were assigned to give quantitative value for each indicator. A value is assigned to each indicator, considering each factor's importance and the level of adoption. If adopted variables are in an operational stage, then they are assigned high scores (4), and level of adoption of variobles is lower a lower score will be assigned: (3), (2), (1). If there is no adoption of considered best practice, the score assigned is (0). The mean value of the score s obtained by each country was used to compare oil spill combat capabilities of each of these countries'. It is clear that the validity and reliability of the result depends mainly on the data collected from the questionnaires, the literature review, and the interviews.The result was useful to classify the countries combative capabilities with regard to oil pollution preparedness levels into different groups and to help identify gaps within the oil pollution preparedness systems in each country.

5.2. Criteria to Assess Countries' Contingency Planning Practices

The following variables were selected as indicators:

- Approval of plan,
- Multilevel plans,
- Review and update of plan,
- Role and responsibilities of competent authorites and stakeholders,
- Environmentally sensitive areas,
- Identification of response resources,
- Sustainable funding,
- Trainings,
- Exercises

Details of indiacators and scoring procedures and scores obtained from each country is given.in Appendix A.

5.3. Criteria to Assess Countries' Response Equipment and Supporting Resources

Efficient implementation of oil spill contingency plans depend on mainly the availibility of equipment and supporting resources. The countries preparedness levels depend on these factors. The following indicators have been selected after considering this.

- Ability to monitor and evaluate oil spill,
- Ability to use different response methods,
- Availability of equipment for response at sea,
- Ability to use oil spill dispersants and availability of dispersant usage policy,
- Availability of oil spill combating expertise,

Details of indicators, scoring procedures, and scores obtained from each country is given in Appendix B.

5.4. Criteria to Assess Countries Legislation and Regulations Related to Oil Pollution Preparedness Response and Compensation for Damages

The implementation levels of relevant International Conventions were selected as an indicator. Accordingly,the availability of national legislations and regulations to implement these Conventions, and the availability of enforcement mechanism were taken into account. The selected indicators are given below.

- Implementation of the Marpol Convention,
- Implementation of the OPRC Convention,
- Implementation of the CLC Convention,
- Implementation of the Fund Convention,
- Implementation of the Bunker Convention,

Details of the indicators, scoring procedures, and scores obtained from each country is given in Appendix C.

5.5. Results of the Comparative Assessment of Countries' Oil Spill Contingency Arrangements

Using the criteria developed, the author undertook a comparative assessment. The results of the assessment are given below.

5.5.1. Assessment of Countries' Contingency Planning Practices

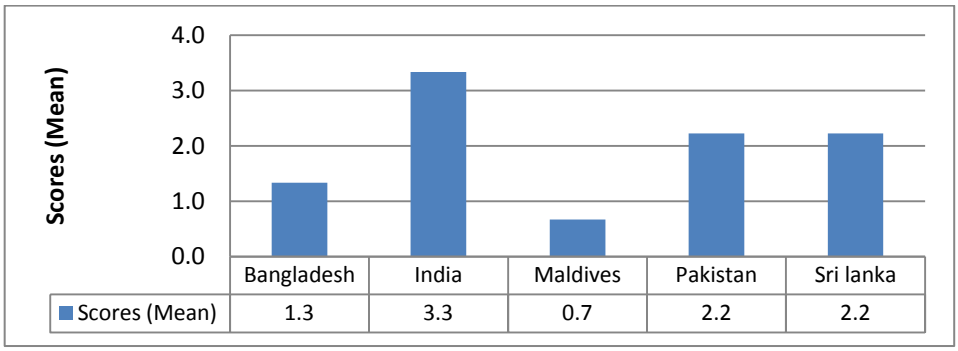

Figure 23: Mean value of scores obtained by each country for the contingency planning practices

Source: Data compiled by the author from the information gathered from questionnaires and other sources.

As can be seen in Figure 23, India has a high score. Pakistan and Sri Lanka, however, have medium-level low scores, while Bangladesh and the Maldives have very low scores. Indian scores are significantly high because India has a comparatively better contingency plan in practice compared to the other countries. India regularly conducts exercises. It has a very concrete and sustainable funding mechanism for preparedness activties. Further, one of the significant features of Indian system is availability of multi-level plans. Therefore, Indian scores are higher than the those for the other countries. There are no approved National Oil Spill Contignecy Plan in place in Bangladesh and the Maldives. However, Bangaldesh has drafted a national plan, but the Maldives' plan is still at the drafting stage. As a consequence, scores for Bangladesh and the Maldives are very low and need a great deal of improvement.

5.5.2. Assessment of Countries' Oil Response Equipment and Supporting Resources

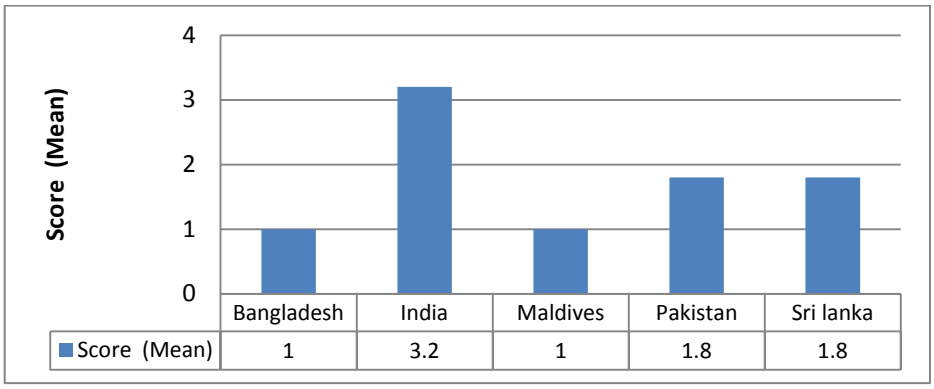

Figure 24: Mean value of the each country obtained for the oil spill response equipment and supporting resources.

Source: Data compiled by the author from the information gathered from questionnaires and other sources

Figure 24 shows that except for India, the four other countries' scores are very low, which means that there is not enough oil spill response equipment and other supporting resouces in Bangladesh, Pakistan, Maldives, and Sri lanka. India has an oil spill dispersant usage policy and also dispersant testing protocol. However the other four cuntries do not have a proper oil spill dispersants usage policy so far. Pakistan and Sri Lanka have approved National Oil Spill Contingency Plans, but the equipment available for oil spills combats is insufficient. The condition of Bangladesh and the Maldives is even worse.The equipment available in these two countries is inadequate to respond to even a small oil spill.

5.5.3. Assessment of Countries' Legislation and Regulations Pertaining to Oil Pollution Preparedness Response and Compensation for Damages

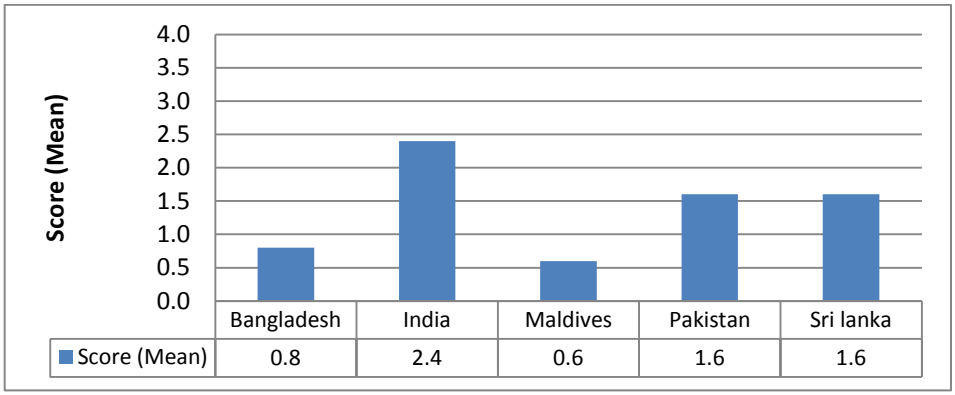

Figure 25: Mean value of scores each country obtained for the legislation and regulations adopted pertaining to oil pollution preparedness and compensation.

Source: Data compiled by the author from the information gathered from questionnaires and other sources

Figure 25 shows that India's score (2.4) is higher than that of the other four countries. However, the Indian score is not very high. India has good contingency plan practices, oil spill combat equipment, and other resources; however, India has not taken enough measures to improve its legislative arrangements. None of the countries in the region is party to the Bunker Convention. India has ratified most of the Conventions related to marine pollution and compensation. It is noteworthy that there are not enough national regulations to implement the measures adopted by International Conventions.The legislation relevant to marine pollution and compensation in Bangladeshi and the Maldives' is very weak. Bangladesh so far, has not taken measures to become party to the CLC and the Fund conventions. Although Bangladesh has become a party to MARPOL and OPRC Convention, there is no national regulations to give effect to these conventions.

5.6. Comparison of Oil Spill Preparedness and Exposure to Oil Pollution Risks

As illustrated in the previous section, it is easy to comparatively assess each country's level of preparedness to combat oil pollution incidents. However, countries should develop oil spill combat capabilities according to the oil pollution risks faced by them. The above results only gave a comparative assessment using the strengths and weaknesses of each country, which can be identified as per the available best practices, equipment and legislation. However, it is always better to assess a country's preparedness level, accoriding to the risks faced, only then can risks be managed at an acceptable level. To measure the exposure to oil spills and the levels of preparedness in terms of combat abilities, the author used the Exposure and Preparedness Index. Exposure of each country to risks of oil spills can be assessed using the following parameters.

- Number of vessel movements per year
- Number of oil tanker movements per year
- Total quantity of oil handled per year
- Number of terminals
- Number of offshore drilling rigs
- Number of offshore production facilities and locations
- Number of oil tankers passing close to the coast and distance from coast to shipping routes
- Total length of oil-carrying pipelines
- Length of sensitive coastline
- Probability of impacts

The parameters used to measure the levels of preparedness response capabilities are:

- Operational national oil spill contingency plans
- Well-defined roles and responsibilities

- Integrated contingency plans at different levels.
- Availability of adequate oil spill response equipment.
- Availability of adequate geographical coverage of response centers.
- Requlariy of exercising of oil spill contingency plans including equipment deployment.
- Trained man-power availability.
- Availability of support tools for response and preparedness.
- Regional level assistance integrated with plan.
- Funding mechanism for response and preparedness.

To assess each parameter, the author used a scoring procedure. The scores have been given according to the evaluation criteria, and the final scores were calculated for preparedness and exposure for each country. Scoring procedures and scores were obtained from each country for exposure and preparedness, which is given in Appendix D.

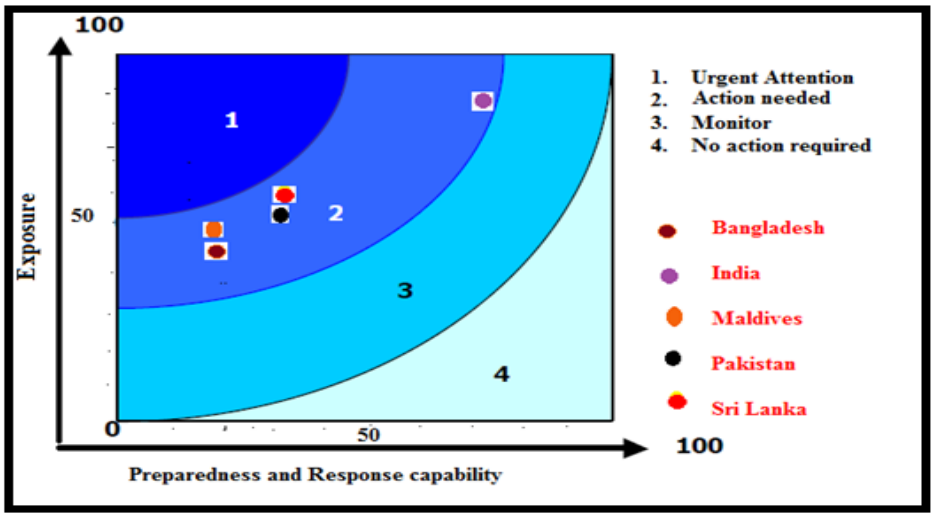

Figure 26: Oil spill Exposure and Preparedness Index of the five countries

Source: Data compiled by the author from the information gathered from questionnaires and other sources

Figure 26 clearly shows that India's exposure to oil pollution incidents is higher than that of the other countries .However, India has taken measures to improve its oil spill combat capabilities. Although the preparedness level need further improvement. Also, the other four countries need to improve their preparedness. The Maldives and Bangladesh's preparedness and response capabilities are very low to compared to the risk for oil pollution. There is no approved National Oil Spill Contignecy Plan so far in Bangladesh or the Maldives. It is necessary to take some concrete action to introduce oil spill preparedness measures in these two countries . Sri lanka and Pakistan are also need to improve their oil spill prepareness capability.

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Chapter 6
Funding Mechanism for Oil Spill Contingency Management

6.1. Background

Past experiences clearly show that oil spills can have a serious impact on the marine environment and economy. Therefore, it is imperative to adopt the necessary measures to prevent and control oil spills wherever possible, and undertake effective response measures if oil spill do occur. This mandates a huge amount to be invested in preparation to effectively respond to oil spills. Most of the developing countries are often in the throes various forms of crisis, which explains why it is difficult for them to invest the requisite fund in the activities that will help counter oil spills and make combating it effectively.

This chapter discusses and reviews the international legal provisions and environmental principal related to the Polluter Pays Principle. This also reviews the funding mechanisms available in various countries for strengthen oil spill preparedness. Lastly, this chapter examines the need for a funding mechanism to enable preparedness in the event of oil spills particularly in South Asian countries, which have been assessed and suggests sustainable funding mechanisms for them.

6.2. Funding Mechanism for Oil Spill Pollution Damages and Oil Spill Response Preparedness

A great percentage of the costs incurred cleaning up and combating the consequences of oil spills including clean up and spill consequences costs may be recovered from the International Liability regime established through the CL Convention, the Fund Convention and the Bunker Convention. The CLC covers the costs of the oil spill from the oil tankers but up to a certain level, while the Fund Convention covers the rest

comparatively larger extent. However, there is an upper limit for the damages cited above. In order to compensate for the damages caused by bunker oil spills, the Bunker Convention offers to cover the costs of oil spills. Through these Conventions, The cost can be recovered only if the costs directly generated due to oil spills. The Polluter Pay Principle is used only for the recover cost of oil spill not for the preparedness for oil spills. Therefore, it is very clear that the cost of oil spill preparedness cannot be recovered through the present International Liability regime.

In addition to that, if the deployed cleanup method is not technically feasible, the cleanup costs also may not be recovered. Therefore, countries are required to establish their oil spill preparedness systems not only to reduce the possible adverse impact but also to recover oil pollution costs including the clean-up costs. Presently, there is no international legal regime for funding oil spill preparedness measures: hence, individual countries have to develop a funding mechanism that will take into account the principle of environmental laws and the other applicable international laws.

6.3. The International Environmental Principle and Legal Regimes Related to Funding of Oil Pollution Response Preparedness

6.3.1.The Polluter Pays Principles and Polluter Pays Principle to Potential Polluters

The Polluter Pay Principle (PPP) is a recognized and widely-used principle in International Environmental law. The Organization for the Economic Cooperation and Development (OECD) adopted PPP as an environmental principle for environmental policy through a council recommendation (OECD, 1972). It is emphasized that the PPP is an economic principle, which can be used for "allocating costs of pollution prevention and control measures". Further, it states that the PPP paves the way for encouraging sustainable use of natural resources and avoids the distortion of international trade and the investment. In 1974 and 1980 the OECD adopted second and third recommendations with regard to the implementation of the Polluters Pays Principle along with certain

financial aspects recommended by the public authorities to prevent and control oil spills, respectively. After that OECD adopted fourth recommendation in 1988, which introduced the concept of Potential Polluter (Veiga & Wonham, 2001). It stated that polluter would have to bear the costs of accidental preparedness.

The Agenda 21 included PPP as a principle in the Article 17.22, it stated that "*develop economic incentives, where appropriate, to apply clean technologies and other means consistent with internalization of environment costs, such as polluter pay principles, so as to avoid degradation of marine environment*" (UNESD, 1992) In addition to that, Agenda 21 accepted the Precautionary Principle for Mitigation of Pollution. It is clear that Agenda 21 and the OECD accepted not only a PPP but also Potential Polluter should pay for the pollution preparedness. Therefore, polluters would henceforth be asked to pay for the costs of preparedness activities to mitigate pollution.

Moreover, the United Nations Convention on the Law of the Sea 1982 (UNCLOS 82) is the umbrella convention and includes the general principle for all activities regarding seas. Article 235 clearly states that the polluter must pay the cost of damages caused because of pollution. According to Articles 192 and 194 of the UNCLOS 82, member states are obliged to take measures to protect and preserve marine environment and to prevent, reduce, and control marine pollution from any source. It is clear that according to the above mentioned Articles, countries should establish measures with regard to pollution control preparedness. However, the UNCLOS 82 has not indicated the funding arrangement for such measures (Fosund, 2004).

The OPRC Convention is a major IMO Convention related to oil pollution preparedness. The preamble of this Convention affirmed that the PPP should be taken into account as a general principle of international environmental law. Also, the convention enforced strong obligations upon the members of the Convention. Accordingly, members were required to prepare a national oil spill contingency plan and maintain sufficient amounts of oil spill response equipment. However, it was not clear whether the OPRC

Convention accepted use of the PPP to fund activities related to oil spill response preparedness.

Basically, it is clear that international law accepts not only a PPP but also accepted use PPP for potential polluter. Therefore, PPP can be used for activities leading to pollution preparedness. There are many countries which are already using this mechanism for funding oil preparedness measures. However, the use of PPP varies from country to country because of the risk of oil pollution and the required levels of preparedness which also varies from one country to another.

6.2.2. Presently Available Funding Schemes for Funding Oil Spill Preparedness

Today, there are two different types of funding models that exits in the world with regard to funding for oil spill preparedness measures and strengthening of oil spill combat capabilities. Some countries' oil pollution preparedness systems depend entirely on the funding offered by their governments while other countries use PPP. (Veiga & Wonham, 2001). Countries which use the PPP utilized different model to collect funds from all potential polluters. The models used for collecting funding for the preparedness activities in different countries are reviewed in the following sections.

6.2.2.1 Australia

The Australian Maritime Safety Authority is the agency responsible for the formulation and implementation of the National Plan to Combat Pollution of the Sea by Oil and other Noxious Substances (AMSA, 2008) Australia uses PPP to potential polluters for funding of their National Plan. The source of fund is a levy imposed on vessels using Australian ports. The fund for preparedness to respond oil spill is enriched by using the Protection of the Sea Levy.

The levy is used the fund for ongoing development, maintenance and administration of the National Plan, acquisition, storage, and maintenance of the equipments and the training program. Also, the levy provides funds to cover oil spill clean-up costs where

the polluters cannot be found and costs cannot be recovered (AMSA, 2011). The levies are imposed on ships through the two Acts, the Protection of the Sea (Shipping Levy Collection Act) and the Protection of the Sea (Shipping Levy Collection) Act. 1981.

According to the Protection of the Sea (Shipping Levy) Act (1981), the levy applies to that ship whose tonnage lengths are not less than 24 meters and which carry more than 10 tons of oil, and which arrive at the Australian ports at any time during a calendar quarter. All levies collected from ships are used entirely for the purpose of strengthening the measures of oil spill response preparedness.

6.2.2.2. New Zealand

The Oil Pollution Fund was established by New Zealand to fund for the oil spill preparedness. The fund provides funds for preparations for the marine oil spill response and pays the costs incurred when responding to spills where the polluter is unidentified. As per the section 333 New Zealand Maritime Transport Act of 1994 and Oil Pollution Levies Order 1998, the Pollution Levy is collected from the risk contributing sectors namely, shipping, fishing, oil exploration, and oil production industries along with the oil pipeline at a rate proportional to the risk created by various activities (MNZ, 2010).

6.2.2.3. Finland

Finland has established a special funding mechanism to fund oil spill preparedness activities. Oil Pollution Fund was established using the levy on oil imported or transported through Finland. The amount of levy on each ton of oil imported was 2.20 Finish National Currency. The levy imposes on oil transported doubled, if the oil was transported in a single hull tanker (Lampela, 2001).

A per the Oil Pollution Compensation Act of 1997, the collection of the Oil Pollution Protection charges is suspended when the total funds available in Oil Pollution Fund reached the Finish National Currency 40 million mark. The collection of charges would be resumed when is reduced to 20 Finish National Currency (Veiga & Wonham, 2001).

This fund is used for acquisition and maintenance of municipal oil combating equipment and is also available for other agencies to combat oil spill and engage in response activities (ITOPF, 2000).

6.2.2.4. Canada

Canada also applies the PPP to potential polluters. However, this method is different from what has been discussed earlier with regard to funding mechanisms. Oil spill preparedness and response in Canada is funded and operated by the private sector. The private organizations maintain respond capability to response oil spill up to 10000 tons. The Canadian Coast Guard has set up standards according to which all response organizations operating in Canada should be certified as being operational by Coast Guard. Oil handing facilities and oil tankers more than tanker 150 gross tonnage and other ships more than 400 gross tonnages are required to have an agreement with certified response organization for the provision of a response in the event of a pollution incident. The oil handling facilities and ships pay the fee for have an agreement with response organization (Fosund, 2004). The principle of potential polluters behind this mechanism and oil handing facilities and ships bear the cost of oil spill response and preparedness indirectly. The Canadian Coast Guard also maintains and upholds significant oil spill response capacity. The Coast Guard is responsible for the certification of oil spill response plans and a fee imposed by the response organization on oil handling facilities and ships. That helps to ensure that the fees are fair and equitable.

6.2.2. 5. Malaysia

Malaysia is another country that applies the PPP to potential polluters for the funding oil spill response arrangements. The Environment Quality Act of 1996 established the Environmental Fund. The one of the main purposes of this was to fund the preventing or combating of spillage and discharge or dumping of oil. The contributions for the fund come from several sources and one of the major sources are those involved in the

exploration, extraction, refining, production, bulk movement, distribution, or storage of oil. This contribution comes through the levy imposed on industry. The rate of levy depends on formula that based on the particular risk of a spill from their operation. A levy also applied to offshore oil transfer facilities the amount of the levy depends on their location, type or risk profile (David, 1999).The fund mange by Department environment and provides money for the Malaysia's preparations for oil spill response. In addition to that it also pays the costs of responding to spills where the spiller is unknown.

In order to ensure that the funds are available for effective and immediate oil spill response, the fund maintains a minimum balance at all time. The mechanism is also available to review fund regularly, in order to ensure levy is imposed on according to relative risk profile. If the risk profile has changed then the rate of levy imposed on organization's activities will change to reflect their contribution vis-a-vis the risk (David, 1999).

6.3. Funding Mechanism Available for Oil Spill Response Preparedness in South Asian Countries

Among the five maritime nations in South Asia only India has a sustainable funding mechanism in place with regard to oil spill response preparedness. India has used the Potential Polluter Pay Principle for ensuring substantial fund .being in place to meet preparedness measures. The fund collection method was established under the Merchant Shipping (Levy of Oil Pollution Cess) Rules, 1988. According to rules, levy is collected at every port in India, and especially stringent on ships which carry oil as cargo. A cess is imposed at the rate of fifty paise for each ton of oil imported by a ship into India in bulk as cargo, and shipped from any place in India in bulk as cargo. The levy is paid by the master, owner or an agent of a ship before the commencement of loading or unloading. However, there is significant difference between India and other countries

with regard to fund management. There is no separate fund to handle the above mentioned levy. The levy is collected from the Oil Pollution Cess directly and goes to the Government Consolidated Fund. Therefore, it is not clear whether the collected fund is directly used for oil spill response preparedness. Also, there is no information related to the use of the collected levy. It is unclear whether the money is used for pollution prevention activities or not. India is the fourth largest oil consumer in the world and if the collected levy can be used to finance oil spill preparedness activities, then it may help to improve oil pollution preparedness in India. However, in comparison with other countries in the region India's oil pollution preparedness levels are among the highest. That may be due to the availability of a funding mechanism.

On the other hand, the other four countries mainly depend on government funds to finance oil pollution preparedness. All these countries have identified the non-availability of sufficient funds as the main problem hindering the development of a comprehensive oil spill response preparedness system. As developing countries, these entities face several other problems and it is, therefore, difficult to allocate sufficient funds solely to combat oil spills. Funding requirements for improvement of oil spill response preparedness has been identified by various countries today; Sri Lanka is required to invest US$ 5 million as the initial fund amount for purchasing combat equipment, training personnel to use this equipment and developing other facilities. Maintaining equipment and other facilities require US$ 45 000 annually. According to estimates available for Pakistan US$ 35 million is required for purchasing of equipment, such as oil spill response vessels, and staff training. The governments in the regional countries have other priorities; therefore, it is not possible to allocate the required amounts of money to finance the oil pollution preparedness activities.

However, any investments in this domain need to be weighed against the damages from the potential oil spills. For instances, the estimated cost of damages due to the Tasman Spirit oil spill was pegged at approximately USD 1.5 to 2 billion (Mian & Benett, 2009).

This very clearly showed that the damage was significantly higher than the required investments for financing oil spill response preparedness. This clearly highlighted that the funds would need to be allocated to strengthen oil spill response preparedness. However, the prevailing economic conditions happen to be such that regional countries do not allow any investment of government funds in this sector because this may be an extra burden on the already burdened governments.

6.4. Suitable Funding Mechanism for the South Asian Region

The main obstacle to an improvement in oil spill response is the non-availability of sustainable funding mechanisms. It is necessary to establish sustainable funding mechanisms to solve this problem by taking into account international practices. When establishing sustainable funding mechanisms, one must evaluate the strength and weaknesses of the available funding mechanisms so that a suitable mechanism may be adopted.

It is clear that countries which apply the PPP to potential polluters have two types of oil spill preparedness systems. There are the privately owned Oil Response Organizations which is the system used by Canada. Oil Response Organizations have given authority to enter into agreement with potential polluters and employ oil spill response when the event of oil spill. In the meantime the government has also established an independent oil spill response mechanism response to major oil spills.

In order to adopt this type of mechanism, a well-developed private sector as well as well-organized government agency is required specially to monitor and inspect oil spill responses and oil spill response mechanisms of other agencies. However, in the South Asian regional countries, these aspects are markedly lacking. Private sectors agencies do not have sufficient fund or expertise to carry out this business. Moreover, the main risk contributors are the passing ships which travel through the international routes in the South Asian region. If the Canadian system applies to South Asian countries, it may not

be applicable to oil pollution incidents caused by these passing ships because these ships have not paid up for the services of privately-owned oil response organizations.

The other system available is the levy on ships and other oil handling agencies. This is in accordance with proportional risk posed by each sector. As discussed earlier, four countries used this system to fund oil spill response preparedness. However, there were some similarities as well as differences between these four countries. The main similarity was in terms of the levy being collected from Potential Polluters which then went in to a separate fund which was used only for oil spill response preparedness activities and always undertook measures to ensure a comprehensive response for oil spills. The main differences lay in the levy, which was imposed in different manners in the four countries. The Australian system covered only the ships and imposed the same amount of levy per gross tonnage for all types of ships. However, when calculating the potential polluter pays levy, the risk factor would need to be taken into account. The Australian system did not take this into consideration and therefore the same amount of levy was imposed on oil tankers and all the other ships. Further, other sectors which posed a significant threat in terms of oil pollution were not been taken into account, for example offshore oil platforms. When we analyze New Zealand's system it is clear that it covers all the risk contributors and accordingly imposes a levy. A similar system is also used in Malaysia, but Malaysia has a common environment fund in place into which money comes from several other sources. The administration of the fund is difficult because it is used for different purposes.

India use PPP and collects the levy based on the amount of oil carried by the ship as cargo. However, it is applicable only in oil tankers which arrive at Indian ports and engage in oil loading or unloading activities. On analyzing the past oil spills in Indian waters, it is clear that most of the oil spills occurs from non- tanker ships while most of the ships visiting the Indian ports are general cargo ships. However, the above levy does not cover the risks posed by these vessels. Therefore, the Indian Oil Pollution Levy

should be amended to cover other risk factors too. Also, the Pollution Levy should be solely used for its intended purposes in a transparent manner. In order to do this as in other countries, a special fund should be established to deposit the levy collected and the administration of fund should be handed to designated authority in charge of oil spill response.

Chapter 7
Conclusions and Recommendations

7. 1. Conclusions

This dissertation assess the oil pollution risks in the South Asian regional countries along with the spill preparedness and combat capabilties of the different countires. After analyzing combat capabilities the study identifies the stregths and weeknesses of each country. Also, the study focuses on the availability of sustainable funding mechanisms to finance oil spill preparedness activities in the South Asian countries . In order to suggest sustainable funding mechanisms, the existing funding mechanism for oil spill preparedness has been studied and accordingly, a suitable funding mechanism has been suggested.

The five maritime nations in the South Asian region are located at strategic locations of the Indian Ocean. These countries are close to international shipping routes which are used to transport oil from the Middle East to the Far East. In addition, in order to cater for the demands of their huge population and other development activities, the countries in the region import large amounts of oil. In addition, most of the countries in region are in process of developing their offshore oil reserves. These factors increase the likelihood of oil pollution incidents. Further, all countries in the region are heavily dependent on coastal and marine resources and have a sensitive coastal ecosystems. In the event of oil spill, there is a risk of irreparable harm being done to the environment and the country's socio economic activities.

In terms of the oil pollution risk among the five regional countries, India faces the highest risk. India imports large amounts of oil from other countries and has a large number of oil terminals and offshore oil wells. Further, the numbers of vessels trafficking through Indian waters are very high. India therefore, faces the likelihood of

very high risk for oil pollution incidents. As discussed earlier, also in the other regional countries the consequences of oil spill may be severe. Pakistan and Sri Lanka are facing risks mainly due to oil transportation and vessel traffic. Bangladesh and the Maldives waters likelihood of oil pollution incidents are relatively low, but the consequences of any oil spill can be very high because these two countries depend heavily on coastal and marine environmental resources. Therefore, the levels of oil pollution risk are medium in these two countries waters.

The South Asian regional countries have taken several measures to prevent and control the impact of a potential oil pollution incident. The implementation of oil pollution legislation is not very praiseworthy in these regional countries except for India. India has become party to all the international conventions related to oil pollution prevention from ships and has already incorporated relevant legal provisions into national legislation. However, there are several gaps. India is party to the OPRC convention, but so far the necessary legal provisions have not been incorporated into the national legislation. Further, India has not been party to the Supplementary Fund and most of the provisions with regard to the Fund Convention and the CLC have not yet been incorporated to the national legislation. However, among the five South Asian countries, implementation of international conventions is the highest in India.

Pakistan's legislation related to oil pollution still has a lot of gaps, even after a well publicized oil spill in its waters, Pakistan has not taken action to party the Fund Convention and the country is party only to the CLC. Pakistan is also party to the OPRC Convention although it has not yet incorporated the relevant legal provisions to national legislation. Sri Lanka is not party to the OPRC Convention; however, it is party to the CLC and Fund Convention 1992. Further, Sri Lanka has incorporated most of the legal provisions in these two conventions into national legislation.

The Maldives is party to the Fund Convention and CLC, but it is not party to the OPRC Convention. Moreover, it is noteworthy to mention that there is no legislation in the Maldives to give effect to all the conventions of which the country is party. Bangladesh does not have sufficient legislation related to oil pollution and not also party to the any of the Liability Conventions nor does it have any national legislation regarding oil pollution liability.

The oil pollution preparedness levels for the four countries except India can at best be termed weak. India established an oil spill preparedness system in 1996. The National Oil Spill Disaster Contingency Plan is updated regularly and maintains a reasonable amount of equipment while consistently training officers in combat oil spill exigencies. Pakistan and Sri Lanka have approved their National Oil Spill Contingency Plans although the implementation of these plans in an effective manner is highly constrained given the lack of trained human resources and combat equipment. Meanwhile, Bangladesh and the Maldives do not have any approved National Oil Spill Contingency Plans neither do they have the equipment nor trained officers' to combat oil spills.

Moreover, there is a marked lack of a regional oil spill contingency arrangement. A regional oil spill contingency plan was drafted in 2000, but this has not reached the implementable stage given the non availability of Memorandum of Understanding among the regional countries. India has capability to provide assistance to the other regional countries in the event of an oil spill, but the other four do not have the capability to even respond to oil spill in their waters. Therefore to ensure effective implementation of the South Asian regional oil spill contingency plan, individual countries oil spill combat capabilities should be strengthened.

The oil spill preparedness levels of any country should be adequate to face a reasonable exposure to oil pollution. Exposure and Preparedness Indexes clearly showed that all the maritime countries in the South Asian region need to take further action to improve their

oil spill preparedness levels to meet required level of preparedness in order to face the relevant oil pollution exposures.

Sustainable funding mechanisms are therefore, required. Furthermore, countries, which has sustainable funding mechanisms in place have better oil spill combat capabilities with sufficient amounts of oil spill combat equipment and trained personnel. However, except India, none of the four countries in the region have sufficient funding from government budgets or sustainable funding mechanism using the PPP system. India has imposed an Oil Pollution Cess and that money is used to finance oil pollution preparedness activities. However, there is no transparency in the Indian funding mechanism and it is not clear whether all levies coming under the Oil Pollution Cess are used for their intended purpose or not.

It was clear that it is difficult to allocate sufficient amounts of fund for oil spill preparedness activities. Therefore, it is necessary to establish sustainable funding mechanism in accordance with accepted international environmental practices and international law. As other countries using PPP to Potential Polluter the South Asian countries can establish sustainable funding mechanisms to finance their oil spill preparedness systems. Hence, it is essential to improve oil spill preparedness levels in the region. The author suggests establishing a funding mechanism to improve oil spill preparedness levels, similar to New Zealand's funding mechanism for oil spill preparedness. The funding system of New Zealand's uses the Polluter Pay Principle and imposes a levy on each sector taking into account the risk posed by the sector and thus it covers all sectors.

7.2. Recommendations

(a). The Maldives and Bangladesh should take the necessary initiatives to establish National Oil Spill Contingency Mechanisms at the earliest to face the risks brought about by shipping and other maritime industries.

(b). Sri Lanka and Pakistan should take initiatives to improve their oil spill combat capabilities to meet necessary requirements. They should maintain an adequate amount of oil spill response equipment and trained personnel with other support resources.

(c). All countries the region should take action to ratify all international convention related to oil pollution and compensation. Further, all countries should incorporate relevant international conventions in the national legislation and should take action to enforce these legal provisions in an effective manner

(d). A clear oil spill dispersant usage policy should be introduced with adequate legislation. Areas should be identified where the dispersants may be used and an oil spill dispersant use approval procedure should be introduced. In addition, the dispersants testing protocol and approval procedure should be incorporated within this policy.

(e). It is necessary to establish a sustainable funding mechanisms to improve oil spill preparedness levels using the Polluter Pays Principle. Using the funds generated through the application of this principle countries should take necessary action to strengthen the oil spill preparedness level. The funds may be used to purchase oil spill combat equipment, train personnel, and respond oil spills when the polluter is unidentified. It is necessary to consider how other countries have solved this issue. The author especially suggests adopting similar systems like the one taken up by New Zealand to provide funds to finance oil spill preparedness activities. It must be noted that a levy must be

imposed on all sectors contributing to the risk according to the level of risk posed by them.

(f). India National Oil Spill Disaster Contingency Plan should be improved according to international guidelines. The ICM should be introduced to coordinate oil spill responses in the country as is done elsewhere in the world. Further action should be taken to establish response centers in selected locations along the coastline to cover the entire coastline of the country. This will reduce response time.

(g).The current funding system for financing oil spill preparedness system in India should be changed. A special fund should be established and the fund should be used for oil spill response and preparedness related activities only. Further, the fund should be audited. The amount of levy should be imposed to all potential polluter according to the degree of risks they pose.

(h). The South Asian Regional Oil Spill Contingency Plan has not become operational thus far. Therefore, all regional countries need to take immediate action and sign the MOU to establish oil spill combat assistance procedures. A Regional Plan put pressure on the countries to take action to strengthen the oil spill contingency procedures in each country.

(i). The Indian Coast Guard has the capability to train oil spill combat personnel at different levels. It is, therefore, recommended that the Indian Coast Guard is used as a Regional Training Center to personnel of regional countries. Such training can be coordinated through the South Asian Cooperative Environment Programme. It will build the regional capacity of oil spill combating as well as lead to development of mutual cooperation among officers in the five countries.

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Appendix A: Assessment of Countires Contingency Plan Practices

Indicator	criteria	score
Status of national contignecy plan	Absence (no plan yet)	0
	Plan in drafting stage	1
	Plan drafted waiting for approval	2
	Plan approved but not in operation satge	3
	Plan approved and tested in operation statge	4
Multi level plan	The country has not aware of the need of contignecy plan at different level	0
	country in process of divelopment of plan in other levels	1
	country has drafted various but not operational stage	2
	Country has developed plans approved and it is in operation stagecoutry had developed plans and tested in can be implemeted in any event of oil spill	3 4
Review and update of plan	no review or update procedure available	0
	the country has prepare a ad hoc procedure to update plan but not follow	1
	the coutry adopted update and review procedure and shedule but not follow accorign to schedule	2
	the coutry has proper procedure and shedulle but occationaly update	3
	The coutry has establised sound schedule and procueres and country is doing update of plan accoring to shedulle and procedure	4
Role and responsibilites of	Contigney plan has not identified competent authority and not given responsibilites of other stakeholder agencies	0

competent authorites and stakeholders	Contignecy plan identfied competent authority and given resposibility but other stake holders resposibility is not given properly	1
	Cotignecy plan describe the some details the role and resposibilites of competent authority and other agencies	2
	Contignecy plan has given details of role and responsibilites. However it has not given command and coordination and communication with satkeholder agencies	3
	contignecy plan clearly define resposibilites of competent suthority and stakeholder agencies and command and communication procedure also established	4
enviroment sensitive areas.	The country has not identifed and officlaly designated sensivtive areas	0
	Country has identifed sensitive areas but detail is not included in plan	1
	The country has identified sensitive areas and incoporated in plan but has not given but not given respnse strtegies	2
	the country ha idetified and incororated details of sensitive areas and has ditermine response strategies and equipment delopyed but not tested	3
	the country has idetifed and incoporated plan stretegy difined and equipmented personel to be deployed diceded and tested	4
Identification of response resources	No mechanism to identify respurces	0
	response resource identifed partially	1
	respose reporces identify in only in government Agenices	
	respons resource indentified in all agenies but not available all details	2
		3
	response agencies identifed in comprehensive manner included all details	4

sustainable funding	No fund available for contignecy plan	0
	limted fund is available not sufficient	1
	fund allocated only to cary out limited acctivties	2
	fund is available from government (through the special levy) buget for all activties but not enough to improve	3
	fund is available using polluter pay principle all fund use intened purposes	4
traning	Training is not provided for any officer	0
	traning is provided limited number of officer only some field	1
	Training is provided some areas sufficeint number of officers but only in some areas. Locall training programme not available	2
	Training provided sufficnet number of officer in relvelnt areas. Some local training programme available	3
	Training provided suffiecent amount of officers local continues training programme available in most of the areas	4
Exercise	no exercise	0
	Only adhoc excerice, only notification procedures	1
	notification and table top excerce conduct accoring to shecdule	2
	notifcation, table top and rarely equipment deployement but participate only a some stakeholders	3
	Notification, table top and equipment deployment excersice according to schedule with out fail with participation of all parties	4

Scores of countries Contingency plan practices					
Indicators	Bangladesh	India	Maldives	Pakistan	Sri lanka
Status of contingency plan	2	4	1	3	3
Multilevel plan	2	4	1	2	2
Review and update of plan	0	3	0	2	2
Role and responsibilities of competent authorities and stakeholders	2	4	2	3	3
Environmentally sensitive areas.	3	3	0	2	3
Identification of response resources	2	3	0	3	3
Sustainable funding	0	3	0	2	2
Training	1	3	1	1	1
Exercise	0	3	1	2	1
Total score	12	30	6	20	20
Mean value	1.333	3.3	0.666	2.222	2.222

Appendix B: Criteraa to Assess Countires Response Equipment and Supporting Resources

Indicator	Criteria	Score
Ability to monitor and evaluation oil spill	no method is available for monitor and evaluate	0
	Naval surveylance use for monitor at the event of spill	1
	Naval and areal surveylence suse for montiro at the events	2
	Naval, areal, and forcasting model used for monitoring at the event of oil spill	3
	naval, areal, satelite emagery used used for monitor oil spill regulary and forcasting omdel is used in the event of spill	4
availability of mechanical reponse equipment at sea to use different response methods	there is not any equipment to mechanical response at season	0
	response at sea can use boom and skimmer but limted	1
	response at sea can use boom, skimmers, dispersant but limited resources	2
	response at sea can use boom, skimmers, dispersant,insitu buring and have sufficent resources	3
	response at sea can use can use all ikdn of response method mentioned above nad have resources to do it effieciet mannner	4
Availability of equipment and resources for the response oil spill onshore	Shoreline clean up –no capsity to shoreline cleanup and protection	0
	Limited capasity to shoreline cleanup but no capasity to shoreline protection	1
	Shoreline cleanup capacity suffieecnet but protection capasity is limited	

	Sholine cleanup capasiy sufficent and protection capasity is all suffiencet Shoreline cleanup capasty and protection capasity both suffient and efficnet	2 3 4
Availability of chemcial disperant and resource and dispersent usage policy	dispersant use acepted response method but do not have capasity to use dispersatn Dispersant use acepted have limited capasity no policy Dispercent use accepted, disppersent using method available only vesel mounted no plociy Dispercent use acepted have capsity and resources to use dispersent using vessel as other method. Policy is available but not dispersnt approval list have engouth dispersant dipersant policy has given are that can be dispersant use, dispersant teesting protocol and authority of testing and approval list is available	0 1 2 3 4
availability of expertise in differnet areas for oil spill response and contignecy planing	No expertice is locally not evailable in the field of contignecy planning, and other areas. Limted number of expertiese available in some fields only limted number of expertiese locally available most of the fields suffiecent number of expertise availble in most of the filed sufficent number of expertise available in all the fields.	0 1 2 3 4

Scores obtained by Each country for response equipment and supporting resources

Criteria to assess countries response equipment and supporting resources					
Indicators	Bangladesh	India	Maldives	Pakistan	Sri lanka
Ability to monitor and evaluation oil spill	1	3	1	3	2
availability of mechanical response equipment at sea to use different response methods	1	3	1	2	2
Availability of equipment and resources for the response oil spill onshore	1	3	1	1	2
Availability of chemical dispersant and resource and dispersant use policy	1	4	1	1	2
availability of expertise in different areas for oil spill response and contingency planning	1	3	1	2	1
Total score	5	16	5	9	9
Mean value	1	3.2	1	1.8	1.8

Appendix C: Critera to Assess Countries Legislation and Regulation Rellated to Oil Pollution Preparedness Response and Compensation for Damages

Indicator	Criteria	Score
Implementation of Marpol convention	Not party to the MARPOL convention and there is not any national legislation relevant to MARPOL	0
	Become a party to the convention and drafted national legilation but not in operation	1
	Become party to the MARPOL and national legslation available but enfocement is week	2
	Ratfied MARPOL, National legsaltion is vailble enfocenet efficent	3 4
OPRC	Not party to the MARPOL convention and there is not any national legislation relevant to MARPOL	0
	Become a party to the convention and drafted national legilation but not inoperation	1
	Become party to the MARPOL and national legslation available but enfocement is week	2
	Ratfied MARPOL convention, National legsaltion and efficent enforcemnt mechanisms are availablent	3 4
CLC	Not party to the CLC convention and there is not any national legislation relevant to CLC	0
	Become a party to the convention and drafted national legilation but not inoperation	1
	Become party to the CLC and national legslation available but enfocement is week	2
	Ratfied CLC, National legsaltion and efficent enforcemnt mechanisms are availablent	3 4
Fund convnetion	Not party to the Fund convention and there is not any national legislation relevant to Fund Convention	0
	Become a party to the convention and drafted national legilation but not inoperation	1
	become party to the Fund and national legslation available but	2

	enfocement is week ratfied Fund convention, National legsaltion and efficent enforcemnt mechanisms are availablent	3 4
	Not party to the Bunker conventionconvention and there is not any national legislation relevant to the Bunker convention Become a party to the convention and drafted national legilation but not inoperation become party to the Bunker convention and national legslation available but enfocement is week ratfied Bunker convention, National legsaltion and efficent enforcemnt mechanisms are availablent	1 2 3 4

Scores-Legislation and regulation related oil pollution preparedness response and compensation for damages

Criteria to assess countries Legislation and regulation related oil pollution preparedness response and compensation for damages					
Indicators	Bangladesh	India	Maldives	Pakistan	Sri lanka
Implementation of Marpol convention	2	3	1	3	2
Implementation OPRC	2	3	0	2	0
Implementation of CLC	0	3	1	3	3
Implementation of Fund	0	3	1	0	3
Implementation of bunker convention	0	0	0	0	0
Total score	4	12	3	8	8
Mean value	0.8	2.4	0.6	1.6	1.6

Appendix D: Scoring Procedures and Scores were Obtained from Each Country for Explosure and Preparedness

Number of vessel	less than 3000	3000- 8000	more than 8000
scale	low	medium	high
score	2	5	10
Total amount of oil import	**less than 100 thousand barrel per day**	**100-500 thousand barrels per day**	**more than 500 thousand barrels per day**
Scale	Low	Medium	High
	2	5	10
Number of oil Terminals	**5**	**10**	**15**
scale	low	medium	high
score	2	5	10
Number of offshore drillin rigs	**les than 3**	**3-5**	**more than 5**
scale	low	medium	high
score	2	4	8
Number of offshore production facilites	**less than 4**	**4-8**	**more than 8**
Scale	low	medium	high

Score	2	5	10
Number of passing oil tankers close to the close and distance form coast to shipping rote	**shipping route is more than 100 nm miles away from coast**	**100-30 nutical miles awy from coast**	**less than 30 natical miles from coast**
Scale	low	medium	high
Score	2	5	10
Total legth of oil carrying pipeline	**less than 50 km**	**50- 200 Km**	**more than 500 km**
Scale	low	medium	high
score	2	5	10
Leght of sensitive coastline	**less than 200**	**200- 500**	**more than 500**
scale	Low	Medium	High
Score	2	5	10
Probability of impacts	Low	Medium	high
score	2	5	10

factor			
Operatonalise National oil spill contignecy plan	**Not available approved plan. Plan is drafted cannot implemented**	**Plan approved and can implemented with some deficiencies**	**fully operationalise plan**
scale	low	medium	high
score	2	5	10
Well define role and responsibilities	**responsibility not given properly for relevant agencies**	**responsibilities given but there are some gaps**	**responsibilities given all related agencies and agreed**
scale	low	medium	high
score	2	5	10
Integrated contingency plan	**not available different level plan**	**only national and tier one plan**	**integrated plan, local, regional, national**
scale	Low	medium	High
score	2	5	10
Availability ofadequate oil spill response equipment	**limited resources, can handle only less than 100 tonnes**	**Limited resources can handle up to 1000-5000**	**resources available to combat oil spill more than5000 tons**
scale	low	medium	high
score	2	5	10
Availabilityof adeqeate geographical coverage of response centers	**less than 2 response centers**	**less than 2-5 response centers**	**more than 5 response centers**

scale	low	medium	high
score	2	5	10
Requlary exercise oil spill contignecy plan incluidng equipment deployment	**No exercise or only notification or table top. No schedule**	**notification and table top and equipment deployment but not regular**	**all type of exercise including equipment deployment regularly ,according to schedule**
scale	low	medium	high
score	2	5	10
Trained man power availability for all areas related to oil spill combat	**very limited man power**	**man power is there but not sufficient**	**sufficient man power**
scale	low	medium	high
score	2	5	10
Availability of support tools for response and preparedness	**Forecasting model, sensitive map and dispersant usage policy. Only one or not available**	**two more tools from above**	**all tools can efficiently use**
scale	low	medium	high
score	2	5	10
regional level assistance integrated to plan	**no procedure to obtain assistance**	**No approved plan but procedure are laid down to take other countries**	**regional plan and MOU available to take assistance other regional**

		assistance	**countries**
scale	low	medium	high
score	2	5	10
Funding mechanism to response and preparedness	**fund very limited for both response and preparedness no funding mechanism**	**sustainable funding mechanism available but not sufficient**	**sustainable funding mechanism and sufficient funds available for both activities**
scale	low	medium	high
score	2	5	10

Scores Obtained in each country for Exposure and preparedness

Parameter	Bangladesh	India	Maldives	Pakistan	Sri Lanka
Exposure					
Number of vessel movement per annum	2	10	2	5	5
Number of oil tanker movement per year	2	10	2	5	5
Total quantity of oil handle per years	2	10	2	5	5
Number of terminals	2	10	2	5	5
Number of offshore drilling rigs	2	5	2	2	2
Number of offshore production facilities and location	0	5	0	0	0
Number of passing oil tankers close to the close and distance from coast to shipping rote	5	10	10	5	10
Total length of oil carrying pipeline	2	10	2	2	2
Length of sensitive coastline	10	5	10	5	5
Probability of impacts	10	10	10	10	10
total score	**37**	**85**	**42**	**44**	**49**
Preparedness					
Operatonalise National oil spill contingency plan	2	10	2	5	5
Role and Responsibilities and well define	2	10	2	5	5
Integrated contingency plan in different level	2	10	2	2	2
Availability adequate of oil spill response equipment	2	10	2	2	2
Availability of adequate geographical coverage of response centers	2	5	2	2	2
Regularly exercise oil spill contingency plan including equipment deployment	2	5	2	5	5
Train man power availability	2	10	2	2	2
Availability of support tools s for response and preparedness	2	5	2	5	5
Regional level assistance integrated to plan	2	2	2	2	2
Funding mechanism for response and preparedness	2	5	2	2	2
Total score	**20**	**72**	**20**	**32**	**32**

Appendix E: Questionnaire

Oil Spill Contingencies Management, its financial arrangement and Implications in the South Asia

Section 1: This section include information of competent national authority in charge of formulation and implementation of National oil spill contingency plan

1.General Information	
Full name of the Institution	
Ministry	
Address	
Telephone	
fax	
Email	

Section2: This section contains information on national contingency plans and other pollution prevention and combating of oil spills and regulatory mechanism. (Tick and complete as appropriate)

2.1 Present status of National Oil spill Contingency Plan and other relevant plan

A. Present status			
Contingency plan approved	i	Approval date	
		Last update date	
Contingency plan drafted		Drafted date	
Contingency plan under preparation		Expected date (date/month/year	
relevant national legislation adopting plan		Act, Regulation	
Other than National plan do you have regional oil spill contingency plans			
How many regional plan do you have		Please give numbers …….	

B. Contingency plan testing			
	Notification exercise	table top exercise	Equipment deployment exercise
Exercise conducted	1 in every …..	1 in ry……	1 in y…….
Authority in charge of plan update			

Authorities in charge in implementing plan	

2.2 RESPONSE STRATEGY

Please provide brief details of your country's spill response strategy and approach toward the below mentioned options.

Please tick the corresponding boxes if applicable and provide further details when available.

A. Monitoring and evaluation of oil spill			
What type of information can be available for monitoring	**Yes**	**NO**	**Remarks, annex**
1. Satellite imagery			
2. Areal surveillance			
3. Naval surveillance			
4. Forecasting models			

B. Response at sea			
are you in position to respond at sea	**yes** ☐	**no** ☐	**remarks- annex**
/What is the capacity of at sea oil spill response	Tons …….		
How is the capacity determined	Skimmers		
	oil Booms		
	Storage		
	Other		
Do you have emergency towing vessels	☐	☐	
How many emergency vessels available			
which method you give priority 1 mechanical methods 2 chemical methods	☐ ☐	**please state as 1, and 2**	

C. Use of oil spill Dispersant	**yes**	**no**	**remarks**
Do you consider use of dispersant as a response strategy			
Do you have related legislation for use of dispersant			
Do you declare delimitation zone for dispersant spray			
Authority in charge of dispersant use approval			

dispersant testing protocol			
List of approval products			
List of competent laboratories authorized to test dispersants on behalf of competent national authorities			
D. In situ burning			
Are you capable to carry out in situ burning			

.

E. **Shoreline protection and cleanup**	**yes**	**no**	**remarks**
Are you in position to carry out shoreline protection			
Are you in position to carry out shoreline clean up			
is the shore line sensitivity is considered in your contingency plan			
F. Waste Management			
Do you have special policy to manage oily waste			
Is there any waste treatment or disposal facility			

.

G. Communication remarks	**yes**	**no**	
have you considered communication in your plan for			
operation activities			
Government /industry relation			
public relation			
media			

.

H. Claim			
Is there any legal basics at national level for claims			
Is the issue of claims included in your contingency plan			
Is there any national structure to deal with claims?			

Section: 3. Equipment and expert available

This section contains information on the expertise and equipment available in the country that the competent national authorities. This section also contains information on the expertise and equipment available in the country for a national emergency.

EXPERTISE AVAILABLE (tick as appropriate)

a. Preparatory activities			Experts and training centers
Environmental sensitivity Atlas or equivalent	**Oil** ☐	**Chemical** ☐	
isk assessment	**Oil** ☐	**Chemical** ☐	
Contingency planning	**Oil** ☐	**Chemical** ☐	
Training of personnel	**Oil** ☐	**Chemical** ☐	
Response to accident operational		**tick if available**	**Training centers**
Fire fighting			
Response to oil at sea			
Response to oil at shore			
Response spill release chemical			
Recovery of lost of packages HNS			
Arial surveillance			
satellite images			
overall emergency management			
modeling and forecasting			
impact wildlife and birds			
impact on fisheries			

RESOURCES (tick as appropriate and/or indicate the quantity accordingly)

B. Personnel support		
	Available for National use, tick if available and give numbers	
Protective cloths		
Respiratory system		
specialized diving equipment		
C. Product	Available for national use	tick if available state amount
Dispersant		L / Tons
Bioremediation agent		L/Tons
Sorbent		Pads
Emulsion breakers		L/ Tons
Other chemical agent		…..

D. equipments		
	Available for national use/ Quantity	
Antipollution vessels		Quantity
Surveillance aircraft		Quantity
Arial spraying aircraft		Quantity
Arial spraying helicopters		Quantity
Oil transfer pumps		Quantity
hoses		Quantity
boom: offshore		Length Meters….
Boom: coastal		Length Meters….
Fire booms		Length Meters….
Skimmers		Quantity
pump		Quantity
Vessel mounted spraying system		Quantity
Portable spraying systems		Quantity
spraying system for helicopters		Quantity
Beach cleaner		Quantity
pressure cleaner		Quantity
vacuum systems		Quantity
Oil storage tanks		Quantity
plastic bags		Quantity
meters and samples		Quantity
others		

.Are the above mentioned equipments own by private or government agencies	
If regional countries requested assistance in an emergency, would you be able to provide these equipment	

if yes which type of assistance can you provide
If no give reasons

D. Training and trained personnel for oil spill handling			
	available (please tick)	**number trained personnel**	**Number training centers**
training for oil spill respondents (OPRC level-1			
OPRC level 2On Scene Commander-			
Oprc level 3-Decision Maker			
Beach cleaning			
Contingency planning			
Other			
E. provide training for neighboring countries			
		Tick	**Number of training centers available**
Do you have capability for train personnel in other countries in region please specify which training programme			

F. Funding mechanism for oil spill contingency management	
From where do you get funds for oil spill preparedness	**Government** ☐ **Special fund** ☐
Do your country use Polluter Pay Principle for funding oil spill preparedness activities	☐
If yes please give details	
How much do you allocate for oil spill contingency management	**USD ……..**
Do you think that presently you have enough	

fund for oil spill preparedness activities	
if not how much additional funding do you need to carry out all activities per year	

Section: 4.International Convention and regional agreements

A. International convention dealing with dealing with maritime safety and dealing with marine pollution

International legal instrument	**Ratification**			**Implementation- already included legal provisions to national regulation**		
	yes	**no**	**Date**	**yes**	**No**	**Specify Act, regulation**
MARPOL annex i&ii						
MARPOL annex iii						
MARPOL annex iv						
MARPOL annex v						
MARPOL annex vi						

B. International convention dealing with combating pollution

International legal instrument	**Ratification**			**Implementation- already included legal provisions to national regulation**		
	yes	**no**	**Date**	**yes**	**No**	**Specify Act, regulation**
OPRC, 1990						
OPRC-HNS Protocol, 2000						

C. International convention dealing with liability and compensation for pollution damages

International legal instrument	**Ratification**			**Implementation- already included legal provisions to national regulation**		
	yes	**no**	**Date**	**yes**	**No**	**Specify Act, regulation**
CLC 1992						
FUND 1992						
1996 HNS Convention						
Bunker Convention, 2001.						
LLMC Protocol 96						
Wreck Removal Convention, 2007						
other						

D. Regional Agreement dealing with pollution combat- south Asian regional oil spill contingency plan and MOU

Status	**Please specify**	**please give details**
South Asian Regional oil spill contingency		

plan approved		
Has your country signed the MOU related to implementation Regional Oil and chemical Spill Contingency Plan		
Do you think that your country can support other countries as specify in Regional oil Spill Contingency Plan		
If no please give details		
If no why		
Do you think that is it important to have a Regional Oil spill Contingency Plan for south Asian region plan		
Please give your ideas to o improve oil spill combat capabilities in south Asian region		

Issues Related Implementation of national oil spill contingency plan (please rank 1,2,3……..)	
1.Do not have enough funding for carry out preparedness activities as planed	
2. Do not have sufficient legal provisions to carry out planed activities for implementation of plan	
3. Non availability of technical capacity	
4.Lack of equipments and human resources	
5.Poor organizational structure and planning	

How can improve oil spill contingency management in your country, please give your ideas.

……..

……
……
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……
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……